



## wwPDB/EMDataBank EM Map/Model Validation Summary Report ⓘ

Aug 17, 2017 – 06:22 PM EDT

PDB ID : 2C7C  
EMDB ID: : EMD-1180  
Title : FITTED COORDINATES FOR GROEL-ATP7-GROES CRYO-EM COM-  
PLEX (EMD-1180)  
Authors : Ranson, N.A.; Clare, D.K.; Farr, G.W.; Houldershaw, D.; Horwich, A.L.;  
Saibil, H.R.  
Deposited on : unknown  
Resolution : 7.70 Å(reported)

This is a wwPDB/EMDataBank EM Map/Model Validation Summary Report  
for a publicly released PDB/EMDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/EMValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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MolProbity : 4.02b-467  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20029824

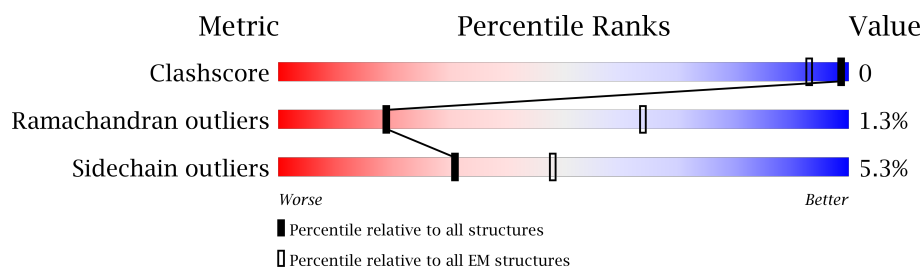
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 7.70 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)	EM structures (#Entries)
Clashscore	125131	1336
Ramachandran outliers	121729	1120
Sidechain outliers	121581	1026

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	547	91% 5% .
1	B	547	93% . .
1	C	547	90% 5% .
1	D	547	92% . .
1	E	547	91% . .
1	F	547	92% . .
1	G	547	92% . .
1	H	547	90% 5% .
1	I	547	91% 5% .

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Mol	Chain	Length	Quality of chain
1	J	547	 90% 6% .
1	K	547	 89% 6% .
1	L	547	 90% 5% .
1	M	547	 90% 5% .
1	N	547	 90% 6% .
2	O	97	 85% 11% .
2	P	97	 77% 18% . .
2	Q	97	 81% 14% .
2	R	97	 79% 15% . .
2	S	97	 85% 10% . .
2	T	97	 85% 10% . .
2	U	97	 79% 16% .

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 57946 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 60 KDA CHAPERONIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	B	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	C	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	D	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	E	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	F	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	G	525	Total	C	N	O	S	0	1
			3805	2397	622	766	20		
1	H	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	I	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	J	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	K	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	L	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	M	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		
1	N	523	Total	C	N	O	S	0	1
			3793	2389	620	764	20		

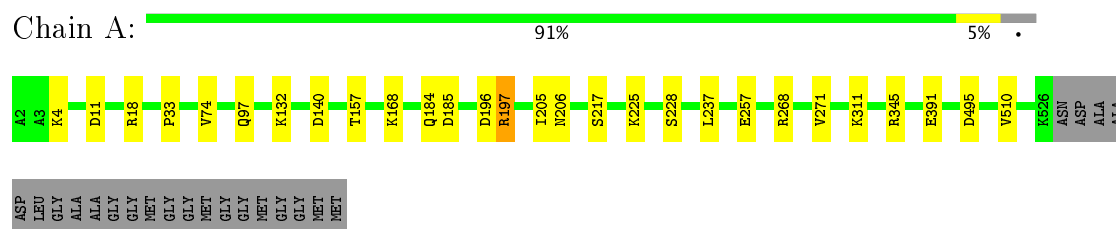
- Molecule 2 is a protein called 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	O	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	P	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	Q	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	R	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	S	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	T	93	Total	C	N	O	S	0	1
			680	432	112	135	1		
2	U	93	Total	C	N	O	S	0	1
			680	432	112	135	1		

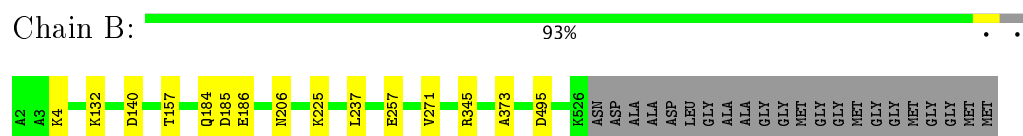
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

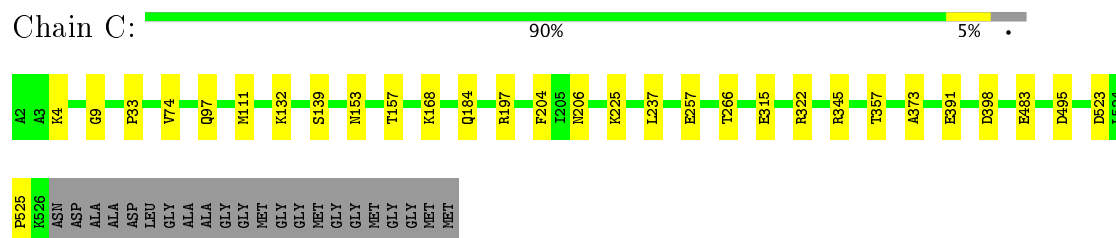
- Molecule 1: 60 KDA CHAPERONIN



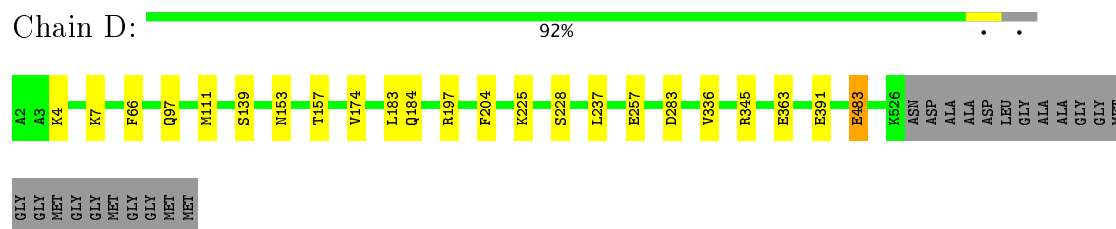
- Molecule 1: 60 KDA CHAPERONIN



- Molecule 1: 60 KDA CHAPERONIN



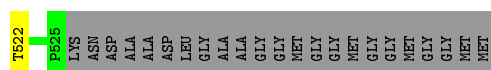
- Molecule 1: 60 KDA CHAPERONIN



- Molecule 1: 60 KDA CHAPERONIN

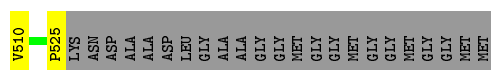






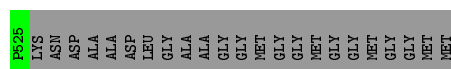
• Molecule 1: 60 KDA CHAPERONIN

Chain K: 89% 6% .



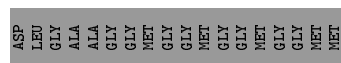
• Molecule 1: 60 KDA CHAPERONIN

Chain L: 90% 5% .



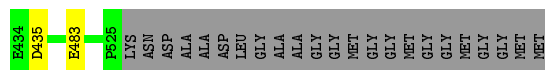
• Molecule 1: 60 KDA CHAPERONIN

Chain M: 90% 5% .



• Molecule 1: 60 KDA CHAPERONIN

Chain N: 90% 6% .




• Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain O: 85% 11% .






- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain P:  77% 18% ..




- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain Q:  81% 14% .




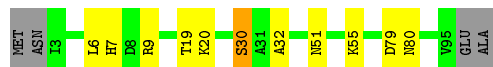
- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain R:  79% 15% ..




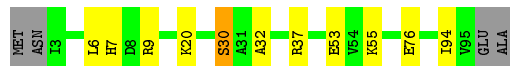
- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain S:  85% 10% ..




- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain T:  85% 10% ..



- Molecule 2: 10 KDA CHAPERONIN MOLECULE: GROES, PROTEIN CPN10, GROES PROTEIN

Chain U:  79% 16% .



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C7	Depositor
Number of particles used	16281	Depositor
Resolution determination method	Not provided	Depositor
CTF correction method	FULL CORRECTION ON 2D CLASS AVERAGES	Depositor
Microscope	FEI TECNAI F20	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	15	Depositor
Minimum defocus (nm)	1100	Depositor
Maximum defocus (nm)	3200	Depositor
Magnification	50000	Depositor
Image detector	KODAK SO-163 FILM	Depositor

## 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  >2	RMSZ	# Z  >2
1	A	0.60	0/3833	0.91	0/5165
1	B	0.60	0/3833	0.91	0/5165
1	C	0.59	0/3833	0.89	1/5165 (0.0%)
1	D	0.59	0/3833	0.90	1/5165 (0.0%)
1	E	0.59	0/3833	0.90	0/5165
1	F	0.59	0/3833	0.90	0/5165
1	G	0.60	0/3833	0.91	0/5165
1	H	0.59	0/3820	0.92	0/5146
1	I	0.60	0/3820	0.91	0/5146
1	J	0.60	0/3820	0.91	0/5146
1	K	0.60	0/3820	0.91	1/5146 (0.0%)
1	L	0.60	0/3820	0.91	0/5146
1	M	0.60	0/3820	0.90	0/5146
1	N	0.60	0/3820	0.91	0/5146
2	O	0.62	0/684	0.97	0/918
2	P	0.62	0/684	1.04	0/918
2	Q	0.63	0/684	0.99	0/918
2	R	0.62	0/684	1.01	1/918 (0.1%)
2	S	0.62	0/684	0.97	1/918 (0.1%)
2	T	0.63	0/684	0.99	0/918
2	U	0.63	0/684	1.00	0/918
All	All	0.60	0/58359	0.91	5/78603 (0.0%)

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
1	A	0	1
1	B	0	1
1	C	0	1
1	D	0	2

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Mol	Chain	#Chirality outliers	#Planarity outliers
1	G	0	1
1	H	0	2
1	I	0	1
1	J	0	3
1	K	0	2
1	L	0	3
1	M	0	2
1	N	1	0
All	All	1	19

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	322	ARG	CD-NE-CZ	5.61	131.46	123.60
2	R	39	GLU	OE1-CD-OE2	-5.18	117.09	123.30
2	S	79	ASP	C-N-CA	5.11	134.48	121.70
1	D	483	GLU	OE1-CD-OE2	-5.01	117.29	123.30
1	K	285	ARG	CD-NE-CZ	5.00	130.60	123.60

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	N	120	ILE	CB

5 of 19 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	4	LYS	Peptide
1	B	4	LYS	Peptide
1	C	4	LYS	Peptide
1	D	183	LEU	Peptide
1	D	4	LYS	Peptide

## 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	3805	0	3881	1	0
1	B	3805	0	3881	0	0
1	C	3805	0	3881	2	0
1	D	3805	0	3881	1	0
1	E	3805	0	3881	2	0
1	F	3805	0	3881	0	0
1	G	3805	0	3881	1	0
1	H	3793	0	3869	2	0
1	I	3793	0	3869	0	0
1	J	3793	0	3869	1	0
1	K	3793	0	3869	1	0
1	L	3793	0	3869	1	0
1	M	3793	0	3869	1	0
1	N	3793	0	3869	0	0
2	O	680	0	703	1	0
2	P	680	0	703	2	0
2	Q	680	0	703	2	0
2	R	680	0	703	2	0
2	S	680	0	703	0	0
2	T	680	0	703	0	0
2	U	680	0	703	0	0
All	All	57946	0	59171	16	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 0.

The worst 5 of 16 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:M:314:LEU:H	1:M:314:LEU:HD12	1.70	0.55
1:D:7:LYS:HE2	1:D:66:PHE:CE2	2.43	0.54
1:E:7:LYS:HE2	1:E:66:PHE:CE2	2.46	0.50
1:H:7:LYS:HE2	1:H:66:PHE:CE2	2.47	0.50
1:A:510:VAL:HG23	1:G:385:THR:HG21	1.94	0.50

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 PDB entries followed by that with respect to all EM entries.

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	523/547 (96%)	490 (94%)	29 (6%)	4 (1%)	22	67
1	B	523/547 (96%)	492 (94%)	30 (6%)	1 (0%)	51	84
1	C	523/547 (96%)	493 (94%)	23 (4%)	7 (1%)	14	56
1	D	523/547 (96%)	494 (94%)	25 (5%)	4 (1%)	22	67
1	E	523/547 (96%)	495 (95%)	22 (4%)	6 (1%)	17	60
1	F	523/547 (96%)	481 (92%)	38 (7%)	4 (1%)	22	67
1	G	523/547 (96%)	491 (94%)	28 (5%)	4 (1%)	22	67
1	H	521/547 (95%)	471 (90%)	44 (8%)	6 (1%)	15	57
1	I	521/547 (95%)	481 (92%)	35 (7%)	5 (1%)	18	61
1	J	521/547 (95%)	475 (91%)	42 (8%)	4 (1%)	22	67
1	K	521/547 (95%)	482 (92%)	35 (7%)	4 (1%)	22	67
1	L	521/547 (95%)	479 (92%)	33 (6%)	9 (2%)	11	50
1	M	521/547 (95%)	479 (92%)	39 (8%)	3 (1%)	28	71
1	N	521/547 (95%)	479 (92%)	31 (6%)	11 (2%)	8	45
2	O	91/97 (94%)	73 (80%)	15 (16%)	3 (3%)	4	35
2	P	91/97 (94%)	71 (78%)	15 (16%)	5 (6%)	2	25
2	Q	91/97 (94%)	74 (81%)	14 (15%)	3 (3%)	4	35
2	R	91/97 (94%)	74 (81%)	13 (14%)	4 (4%)	3	29
2	S	91/97 (94%)	70 (77%)	16 (18%)	5 (6%)	2	25
2	T	91/97 (94%)	73 (80%)	14 (15%)	4 (4%)	3	29
2	U	91/97 (94%)	73 (80%)	11 (12%)	7 (8%)	1	18
All	All	7945/8337 (95%)	7290 (92%)	552 (7%)	103 (1%)	19	56

5 of 103 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	197	ARG
1	C	483	GLU
1	H	154	SER
1	H	483	GLU
1	I	154	SER

### 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 PDB entries followed by that with respect to all EM entries.

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	404/414 (98%)	381 (94%)	23 (6%)	24	56
1	B	404/414 (98%)	391 (97%)	13 (3%)	44	71
1	C	404/414 (98%)	385 (95%)	19 (5%)	30	62
1	D	404/414 (98%)	389 (96%)	15 (4%)	39	68
1	E	404/414 (98%)	388 (96%)	16 (4%)	36	65
1	F	404/414 (98%)	388 (96%)	16 (4%)	36	65
1	G	404/414 (98%)	390 (96%)	14 (4%)	41	69
1	H	403/414 (97%)	383 (95%)	20 (5%)	28	60
1	I	403/414 (97%)	383 (95%)	20 (5%)	28	60
1	J	403/414 (97%)	381 (94%)	22 (6%)	25	58
1	K	403/414 (97%)	378 (94%)	25 (6%)	21	54
1	L	403/414 (97%)	384 (95%)	19 (5%)	30	62
1	M	403/414 (97%)	381 (94%)	22 (6%)	25	58
1	N	403/414 (97%)	382 (95%)	21 (5%)	27	59
2	O	76/80 (95%)	69 (91%)	7 (9%)	11	37
2	P	76/80 (95%)	64 (84%)	12 (16%)	3	18
2	Q	76/80 (95%)	67 (88%)	9 (12%)	6	27
2	R	76/80 (95%)	66 (87%)	10 (13%)	5	24
2	S	76/80 (95%)	70 (92%)	6 (8%)	14	45
2	T	76/80 (95%)	68 (90%)	8 (10%)	8	32

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	U	76/80 (95%)	67 (88%)	9 (12%)	6	27
All	All	6181/6356 (97%)	5855 (95%)	326 (5%)	31	59

5 of 326 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	302	SER
1	K	114	MET
2	R	81	GLU
1	I	426	LEU
1	J	351	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	97	GLN
1	L	432	GLN
1	L	436	GLN

### 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 carbohydrates 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.