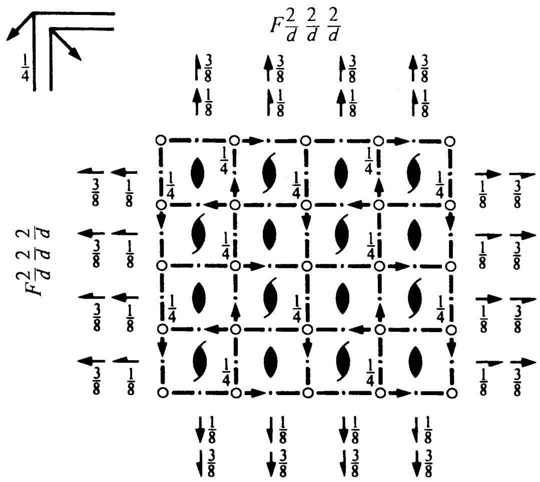
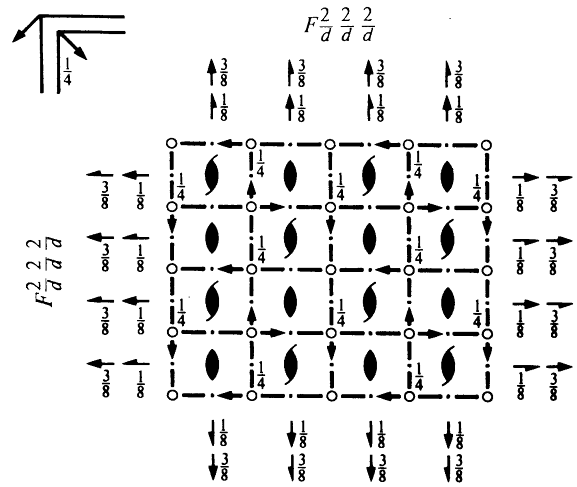
International Tables for Crystallography (2006). Vol. A, Space group 70, pp. 322–323.

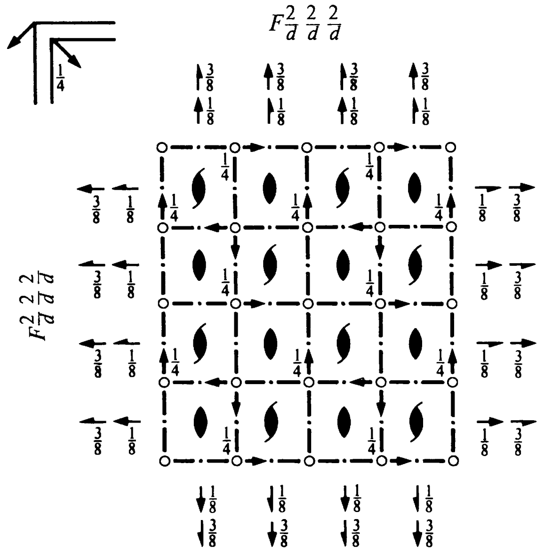
F d d d D_{2h}^{24} *mmm* Orthorhombic

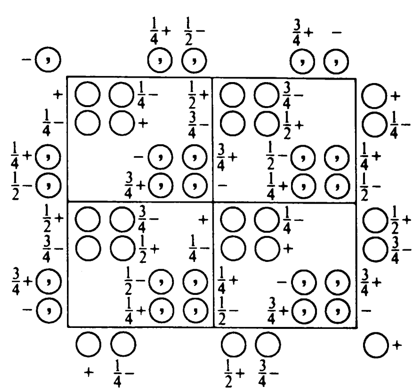
No. 70 $F\ 2/d\ 2/d\ 2/d$ Patterson symmetry *F mmm*

ORIGIN CHOICE 2









Origin at $\bar{1}$ at *ddd*, at $\frac{1}{8},\frac{1}{8},\frac{1}{8}$ from 222

Asymmetric unit $0 \le x \le \frac{1}{8}$; $-\frac{1}{8} \le y \le \frac{1}{8}$; $0 \le z \le 1$

Symmetry operations

For $(0,0,0)+$ set

(1) 1	(2) 2 $\frac{3}{8},\frac{3}{8},z$	(3) 2 $\frac{3}{8},y,\frac{3}{8}$	(4) 2 $x,\frac{3}{8},\frac{3}{8}$
(5) $\bar{1}$ 0,0,0	(6) $d(\frac{1}{4},\frac{1}{4},0)$ $x,y,0$	(7) $d(\frac{1}{4},0,\frac{1}{4})$ $x,0,z$	(8) $d(0,\frac{1}{4},\frac{1}{4})$ $0,y,z$

For $(0,\frac{1}{2},\frac{1}{2})+$ set

(1) $t(0,\frac{1}{2},\frac{1}{2})$	(2) $2(0,0,\frac{1}{2})$ $\frac{3}{8},\frac{1}{8},z$	(3) $2(0,\frac{1}{2},0)$ $\frac{3}{8},y,\frac{1}{8}$	(4) 2 $x,\frac{1}{8},\frac{1}{8}$
(5) $\bar{1}$ $0,\frac{1}{4},\frac{1}{4}$	(6) $d(\frac{1}{4},\frac{3}{4},0)$ $x,y,\frac{1}{4}$	(7) $d(\frac{1}{4},0,\frac{3}{4})$ $x,\frac{1}{4},z$	(8) $d(0,\frac{3}{4},\frac{3}{4})$ $0,y,z$

For $(\frac{1}{2},0,\frac{1}{2})+$ set

(1) $t(\frac{1}{2},0,\frac{1}{2})$	(2) $2(0,0,\frac{1}{2})$ $\frac{1}{8},\frac{3}{8},z$	(3) 2 $\frac{1}{8},y,\frac{1}{8}$	(4) $2(\frac{1}{2},0,0)$ $x,\frac{3}{8},\frac{1}{8}$
(5) $\bar{1}$ $\frac{1}{4},0,\frac{1}{4}$	(6) $d(\frac{3}{4},\frac{1}{4},0)$ $x,y,\frac{1}{4}$	(7) $d(\frac{3}{4},0,\frac{3}{4})$ $x,0,z$	(8) $d(0,\frac{1}{4},\frac{3}{4})$ $\frac{1}{4},y,z$

For $(\frac{1}{2},\frac{1}{2},0)+$ set

(1) $t(\frac{1}{2},\frac{1}{2},0)$	(2) 2 $\frac{1}{8},\frac{1}{8},z$	(3) $2(0,\frac{1}{2},0)$ $\frac{1}{8},y,\frac{3}{8}$	(4) $2(\frac{1}{2},0,0)$ $x,\frac{1}{8},\frac{3}{8}$
(5) $\bar{1}$ $\frac{1}{4},\frac{1}{4},0$	(6) $d(\frac{3}{4},\frac{3}{4},0)$ $x,y,0$	(7) $d(\frac{3}{4},0,\frac{1}{4})$ $x,\frac{1}{4},z$	(8) $d(0,\frac{3}{4},\frac{1}{4})$ $\frac{1}{4},y,z$

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; $t(0,\frac{1}{2},\frac{1}{2})$; $t(\frac{1}{2},0,\frac{1}{2})$; (2); (3); (5)

Positions

Multiplicity, Wyckoff letter, Site symmetry			Coordinates $(0,0,0)+$ $(0,\frac{1}{2},\frac{1}{2})+$ $(\frac{1}{2},0,\frac{1}{2})+$ $(\frac{1}{2},\frac{1}{2},0)+$				Reflection conditions
							General:
32	h	1	(1) x,y,z	(2) $\bar{x}+\frac{3}{4},\bar{y}+\frac{3}{4},z$	(3) $\bar{x}+\frac{3}{4},y,\bar{z}+\frac{3}{4}$	(4) $x,\bar{y}+\frac{3}{4},\bar{z}+\frac{3}{4}$	hkl : $h+k,h+l,k+l=2n$
			(5) $\bar{x},\bar{y},\bar{z}$	(6) $x+\frac{1}{4},y+\frac{1}{4},\bar{z}$	(7) $x+\frac{1}{4},\bar{y},z+\frac{1}{4}$	(8) $\bar{x},y+\frac{1}{4},z+\frac{1}{4}$	$0kl$: $k+l=4n,\ k,l=2n$
							$h0l$: $h+l=4n,\ h,l=2n$
							$hk0$: $h+k=4n,\ h,k=2n$
							$h00$: $h=4n$
							$0k0$: $k=4n$
							$00l$: $l=4n$
							Special: as above, plus
16	g	. . 2	$\frac{1}{8},\frac{1}{8},z$	$\frac{5}{8},\frac{1}{8},\bar{z}+\frac{3}{4}$	$\frac{7}{8},\frac{7}{8},\bar{z}$	$\frac{3}{8},\frac{7}{8},z+\frac{1}{4}$	hkl : $h=2n+1$ or $h+k+l=4n$
16	f	. 2 .	$\frac{1}{8},y,\frac{1}{8}$	$\frac{5}{8},\bar{y}+\frac{3}{4},\frac{1}{8}$	$\frac{7}{8},\bar{y},\frac{7}{8}$	$\frac{3}{8},y+\frac{1}{4},\frac{7}{8}$	
16	e	2 . .	$x,\frac{1}{8},\frac{1}{8}$	$\bar{x}+\frac{3}{4},\frac{5}{8},\frac{1}{8}$	$\bar{x},\frac{7}{8},\frac{7}{8}$	$x+\frac{1}{4},\frac{3}{8},\frac{7}{8}$	
16	d	$\bar{1}$	$\frac{1}{2},\frac{1}{2},\frac{1}{2}$	$\frac{1}{4},\frac{1}{4},\frac{1}{2}$	$\frac{1}{4},\frac{1}{2},\frac{1}{4}$	$\frac{1}{2},\frac{1}{4},\frac{1}{4}$	hkl : $h=2n+1$ or $h,k,l=4n+2$ or $h,k,l=4n$
16	c	$\bar{1}$	$0,0,0$	$\frac{3}{4},\frac{3}{4},0$	$\frac{3}{4},0,\frac{3}{4}$	$0,\frac{3}{4},\frac{3}{4}$	
8	b	2 2 2	$\frac{1}{8},\frac{1}{8},\frac{5}{8}$	$\frac{7}{8},\frac{7}{8},\frac{3}{8}$			hkl : $h=2n+1$ or $h+k+l=4n$
8	a	2 2 2	$\frac{1}{8},\frac{1}{8},\frac{1}{8}$	$\frac{7}{8},\frac{7}{8},\frac{7}{8}$			

Symmetry of special projections

Along [001] $c2mm$	Along [100] $c2mm$	Along [010] $c2mm$
$\mathbf{a}'=\frac{1}{2}\mathbf{a}$ $\mathbf{b}'=\frac{1}{2}\mathbf{b}$	$\mathbf{a}'=\frac{1}{2}\mathbf{b}$ $\mathbf{b}'=\frac{1}{2}\mathbf{c}$	$\mathbf{a}'=\frac{1}{2}\mathbf{c}$ $\mathbf{b}'=\frac{1}{2}\mathbf{a}$
Origin at $\frac{1}{8},\frac{1}{8},z$	Origin at $x,\frac{1}{8},\frac{1}{8}$	Origin at $\frac{1}{8},y,\frac{1}{8}$

Maximal non-isomorphic subgroups

I	[2] $F\,d\,d\,2$ (43)	(1; 2; 7; 8)+
	[2] $F\,d\,2\,d$ ($F\,d\,d\,2$, 43)	(1; 3; 6; 8)+
	[2] $F\,2\,d\,d$ ($F\,d\,d\,2$, 43)	(1; 4; 6; 7)+
	[2] $F\,2\,2\,2$ (22)	(1; 2; 3; 4)+
	[2] $F\,1\,1\,2/d$ ($C\,2/c$, 15)	(1; 2; 5; 6)+
	[2] $F\,1\,2/d\,1$ ($C\,2/c$, 15)	(1; 3; 5; 7)+
	[2] $F\,2/d\,1\,1$ ($C\,2/c$, 15)	(1; 4; 5; 8)+

IIa none

IIb none

Maximal isomorphic subgroups of lowest index

IIc [3] $F\,d\,d\,d$ ($\mathbf{a}'=3\mathbf{a}$ or $\mathbf{b}'=3\mathbf{b}$ or $\mathbf{c}'=3\mathbf{c}$) (70)

Minimal non-isomorphic supergroups

I [2] $I\,4_1/a\,m\,d$ (141); [2] $I\,4_1/a\,c\,d$ (142); [3] $F\,d\,\bar{3}$ (203)

II [2] $P\,n\,n\,n$ ($\mathbf{a}'=\frac{1}{2}\mathbf{a},\mathbf{b}'=\frac{1}{2}\mathbf{b},\mathbf{c}'=\frac{1}{2}\mathbf{c}$) (48)