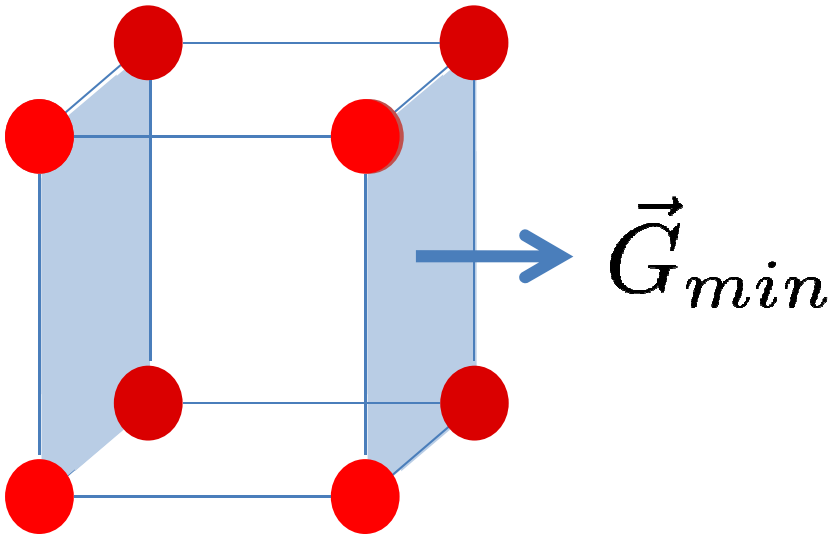
Slides
Condensed Matter Physics
Lecture 12

$e^{i\vec{G}\cdot\vec{R}} = 1$ assures all lattice points included in defined planes $e^{i\vec{G}\cdot\vec{x}} = 1$ but…

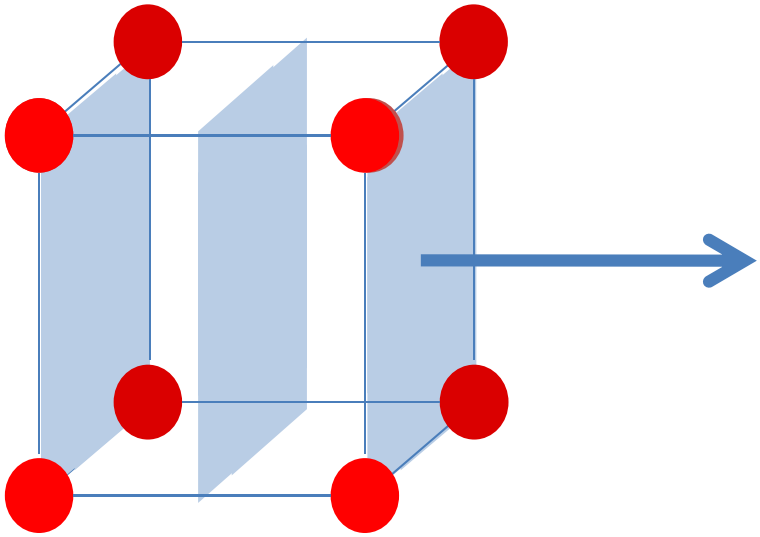
Only for $\vec{G}_{min}$ are all planes lattice planes.

$$d = \frac{2\pi}{|\vec{G}_{min}|}$$

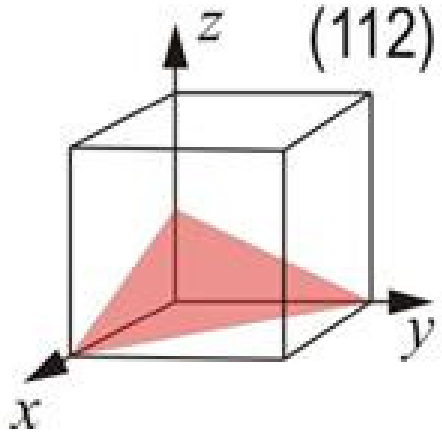


$\vec{G}_{min}$

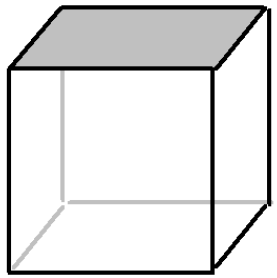
$$d = \frac{2\pi}{2|\vec{G}_{min}|}$$



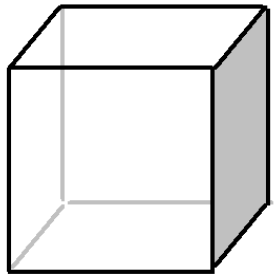
$\vec{G} = 2\vec{G}_{min}$



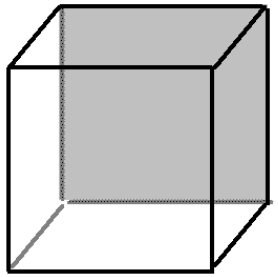
Some Examples of
Miller Indices



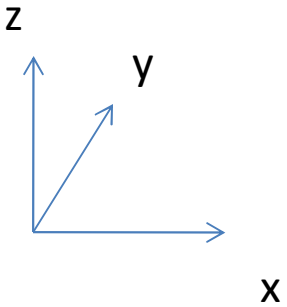
(001)

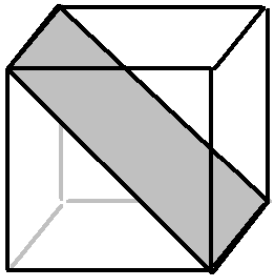


(100)

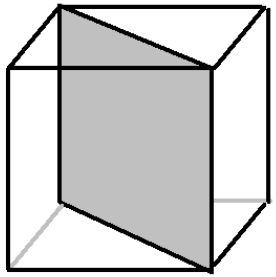


(010)

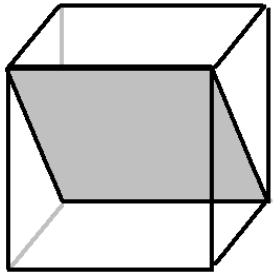




(101)



(110)



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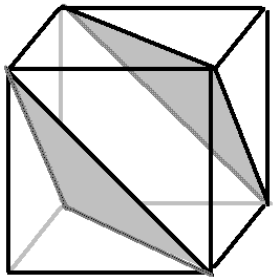
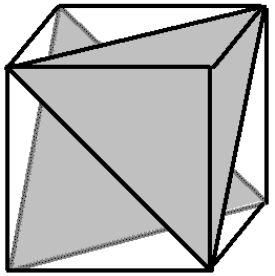
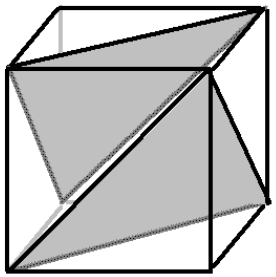


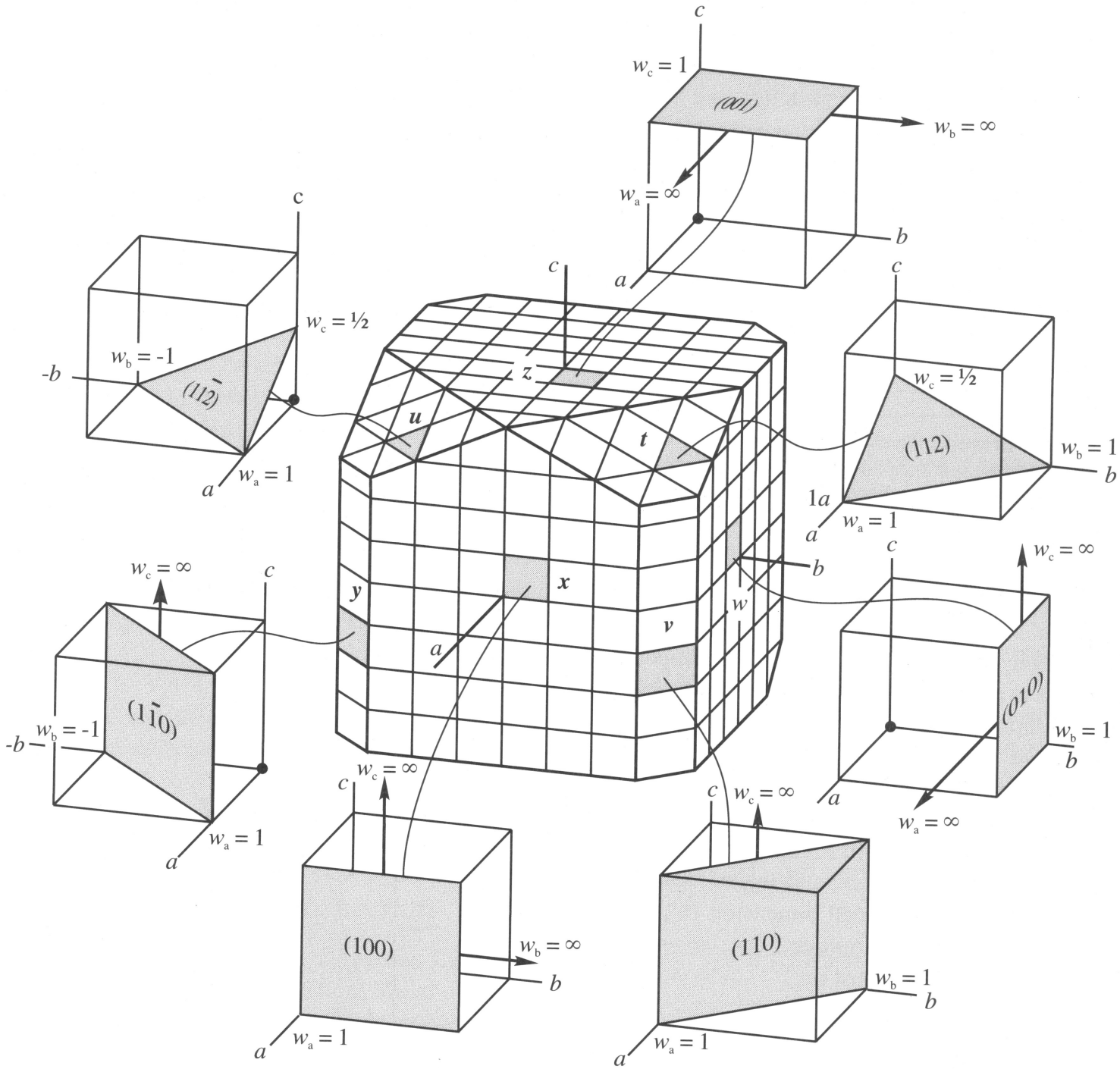
(111)



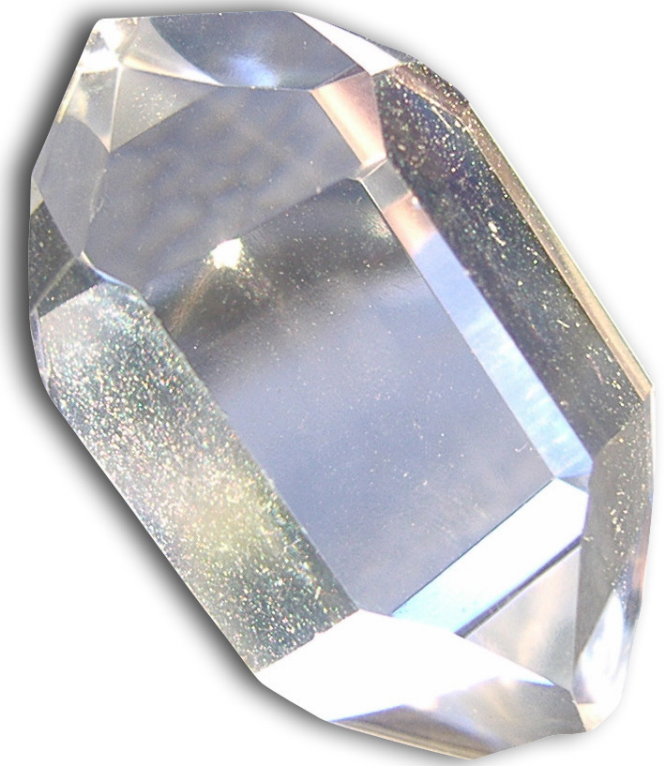
(1$\bar{1}$1)



($\bar{1}$11)

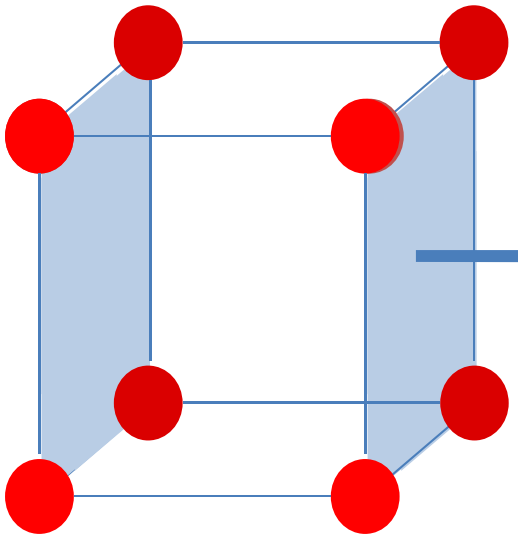

c
$w_c = 1$
(001)
$w_b = \infty$
$w_a = \infty$
b
a
c
$w_c = ½$
$w_b = -1$
-b
$(11\bar{2})$
$w_a = 1$
a
z
u
t
x
y
v
w
b
c
$w_c = ½$
(112)
$w_b = 1$
b
1a
$w_a = 1$
a
$w_c = \infty$
c
$w_b = -1$
-b
$(1\bar{1}0)$
$w_a = 1$
a
c
$w_c = \infty$
(010)
$w_b = 1$
b
a
$w_a = \infty$
c
$w_c = \infty$
(100)
$w_b = \infty$
b
a
$w_a = 1$
c
$w_c = \infty$
(110)
$w_b = 1$
b
a
$w_a = 1$

NaCl (FCC with basis)



Quartz (Trigonal SiO_2)

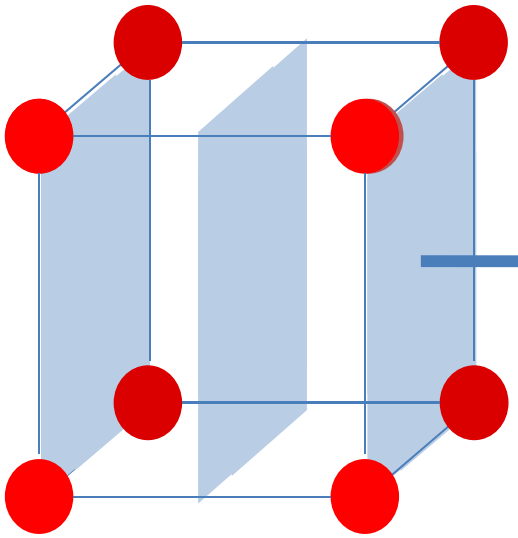
$$d = \frac{2\pi}{|\vec{G}_{min}|}$$



$\vec{G}_{min}$

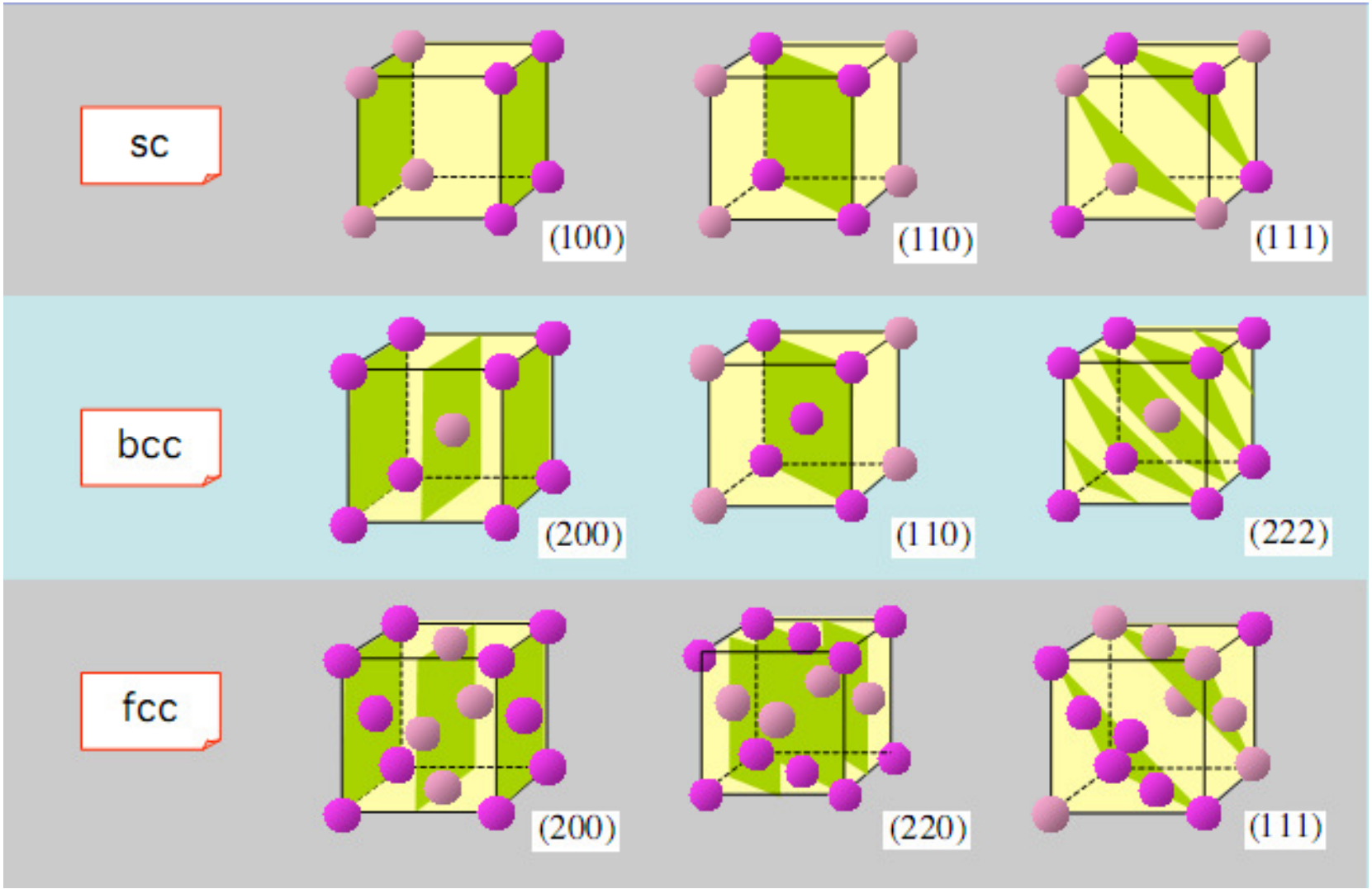
(1 0 0)

$$d = \frac{2\pi}{2|\vec{G}_{min}|}$$



$\vec{G} = 2\vec{G}_{min}$

(2 0 0)


sc
(100)
(110)
(111)
bcc
(200)
(110)
(222)
fcc
(200)
(220)
(111)