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are neglected. %'e also assume that for a small energy in-
terval the joint density of states p, „(E) can be obtained
using the parabolic band model, thus

QE;„„E—in the Taylor expansion), near-band-edge
RDS can be expressed as

p, „(E) (2m,*) i QE E—;„„, R

=Pg(2 m,*) bI, „(q)+E;„, E— (8)

where m „*=(m „m,) /(m, +m,) is the reduced valence-
conduction effective mass, and E;„, is the minimum
transition energy from band v to the conduction-band
minimum. These are good approximations for ordered
and disordered" alloys. In CuPt-ordered alloys the top of the valence bands (denoted I s, and I 7, in the disor-dered alloy) consists of the three states I ~, ~, —= ~ 1), I 6",

=—2), and I ~6,

' ——~3). The transitions I) ~~c),
~2)~ c), and ~3)~ c) from these valence states to the conduction-band minimum ~c) occur at the energies
denoted E;„,=E~, Eg +DE&2, and Eg +hE», respec-tively, where AE,. =E;—E.. Using Kramers-Kronig re-lations" we can obtain the real part of the dielectric func-tion e, from e2 of Eq. (5). Near the band edge this gives'

where the intensity difference at e &

and e2 is

bI,,(q) =I,,(e„rl) I,—,(e2,g),
and the coefficient P is

2e 2p2

z

fi cosm ono(" o 1)

(10)

Here A'co =E, mo is the free-electron mass, no is the re-

fraction index in the absence of ordering, and I'„=~ (x

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on the ratio between the crystal-field splitting 5 (il) and the spin-orbit splitting 5 (il) and increases with rt F.or Gao sInz sP with its small b, and large b,

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these approximations hold for Gao 5Ino 5As up to
(bE—)'~ ~ 0.2 eV'~, while for Gao sino sP the applica-
bility of Eqs. (20) and (21) is restricted to
(b,E—&)' ~0. 1 eV'. In general, however, the cou-
pling between the crystal-field splitting and the spin-orbit
splitting causes AI, 2, AI, 3, and AE,2/6 to vary with q, unlike what simplifications (18) and (19) suggest. We fur-
ther see that all experimental data points shown in Fig.
2(a) exceed the [—AE]'~ ~ tl region where Eqs. (20) and
(21) are applicable. Consequently, by fitting experimental
data to Eqs. (20) and (21), the valence-band splitting bE, 2
is overestimated. ' Furthermore, a large value of the pa-
rameter A = —0.068 (eV '~) was needed in Ref. 9 to fit
Eq. (21) to the experimental data for Gao sino sp. This
number, however, is about 80% too large' relative to our

theoretical estimate A = —0.038 (eV '

).

UI. SUMMARY

We have derived a general formula for ordering-
induced bulk RDS intensity near the band edge as a func-

tion of ordering parameter g. Our results do not include the surface contribution to RDS, which could be impor-tant. We find that our calculated peak RDS intensity at