abstract
Gamma-ray bursts and supernovae are violent explo-
sive phenomena in the Universe. Neutrinos can pro-
vide us with precious opportunities to probe these
phenomena even deep under the photosphere, which
cannot be seen by electromagnetic observations.
Nonthermal neutrinos from jets have been commonly
considered assuming that cosmic rays are accelerated,
but this is not guaranteed at subphotospheres. We de-
rive general constraints for production of TeV-PeV
neutrinos, and show that low-luminosity jets are more
favored.
The same argument is applied to supernovae, and rela-
tivistic supernovae and super-luminous supernovae
are found to be promising sources. Finally, we discuss
roles of neutron-loaded outflows and show the im-
portance of quasithermal neutrinos in the GeV-TeV
range. The neutron-proton-conversion mechanism fur-
ther boosts neutrino energies, enhancing the detecta-
bility of GeV-TeV neutrinos from gamma-ray bursts
and supernovae.