Chen *et al.* Reply: Arafune *et al.* [1] had been able to measure the interference patterns (IP) in the $\sqrt{3} \times \sqrt{3}$ silicene (with respect to 1×1 silicene) on Ag(111) at much lower energy than we had. Their data are helpful, but not sufficient, to claim that the IP is originating from the Ag surface state and not the Dirac fermion state. For this we would like to point out a few things.

First, their method of measuring the wavelength of IP is questionable. As we have reported recently, the $\sqrt{3} \times \sqrt{3}$ silicene will undergo a phase transition when the temperature is lowered from 77 to 6 K [2]. As a result, the surface is phase separated into small triangular domains separated by domain boundaries, which is also observed by Arafune *et al.* in their Fig. 1(a). More importantly these domain boundaries are the dominant scattering centers, resulting in quantum confinement of waves within the domain [see Fig. 1(b)]. Another factor influencing the IP is the domain boundaries themselves, which not only act as scattering centers but also as 1D nanowires with delocalized electronic states involved. The electrons in domain boundaries can be scattered at their ends and form 1D IP [see Fig. 1(b)]. As a result, the Fourier transform images of dI/dV maps show a hexagon in the center instead of a ring. So, it is quite doubtful how one can determine the wave vector from these hexagonal patterns, and with such accuracy that they do not need an error bar in their Fig. 1(d).

In contrast, in Ref. [3] we measured the IP of $\sqrt{3} \times \sqrt{3}$ phase at 77 K, before the phase transition occurs. So the honeycomb structure of silicene is uniform for the whole surface. The wave number of the IP is determined by directly measuring the wavelength of Friedel oscillations near a straight step in dI/dV maps. We have also integrated the signal along the straight steps to enhance the signal-to-noise ratio. This method is reliable and accurate. However, unfortunately, at very low bias we could not observe significant IP, likely due to the suppressed backscattering in this particular system and relatively high temperature, which smear our the dI/dV signal.

Second, DFT calculations with van der Waals interaction correction have been reported in our recent work [2], which reproduced the two rhombic $\sqrt{3} \times \sqrt{3}$ structures of silicene, and explain the phase transition perfectly. The calculations also pointed out that the $\sqrt{3} \times \sqrt{3}$ structure is monolayer silicene, and the interaction between silicene and Ag(111) is weak enough that silicene can maintain the linear dispersion. For comparison, Arafune *et al.* had performed calculation on the 4×4 silicene and found significant influence of the substrate [4], but they did not study the $\sqrt{3} \times \sqrt{3}$ structure.

Finally, the linearity of a Dirac cone can be distorted by surface-interface interaction or Dirac cone warping [5]. Therefore, linear dispersion is strong but not conclusive evidence of Dirac fermions. Other features such as the quasiparticle chirality, which never exist in conventional
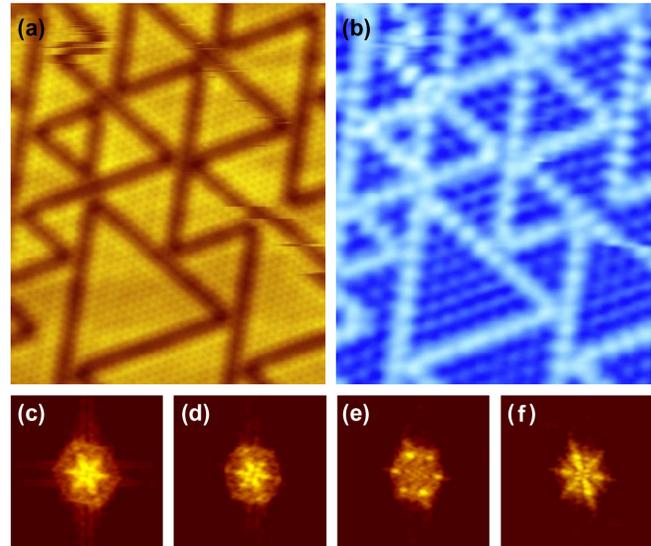

FIG. 1 (color online). (a) STM image of $\sqrt{3} \times \sqrt{3}$ silicene on Ag(111). The scan area is 25 nm $\times$ 30 nm. (b) dI/dV map for the same area in (a), $V_{\text{tip}} = -1.2$ V. (c) Fourier transform image of (b). (d)–(e) Fourier transform images of dI/dV maps for the same area in (b). Scanning bias: (d) -1.0 V; (e) -0.8 V; (f) -0.6 V.

2DEG like the Ag surface state, are more robust and conclusive. In a recent report [6] we have found the chirality of Dirac fermions in $\sqrt{3} \times \sqrt{3}$ silicene.

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