Spectrum sharing among cellular users has been a promising approach to attain better efficiency in the use of the limited spectral bands. The existing dynamic spectrum access techniques include sharing of the licensed spectrum bands by allowing other 'secondary' users to use the bands if the licensee 'primary' user is idle. Primary-secondary spectrum sharing is limited in terms of design space, and may not be sufficient to meet the ever-increasing demand of connectivity and high signal quality to improve the end-users' wireless experience. The next step to increase spectrum efficiency is to design markets where sharing takes place pervasively among primary providers rather than leaving it to the limited case of when the primary licensee is idle. Attaining contractual pervasive spectrum sharing among primary providers, a.k.a. co-primary spectrum sharing (Co-PSS), involves additional costs for the users, e.g., roaming fee. Co-PSS without additional charge to the users poses two major challenges: 1) regulatory approaches must be introduced to incentivize and encourage providers for sharing spectrum resources, and 2) small providers in Co-PSS markets may freeride on large providers' networks as the customers of the small providers may be using the spectrum and infrastructure resources of large providers. Such freeriding opportunities in Co-PSS markets must be minimized to realize the benefits of primary-level sharing. This work considers a subsidy-based spectrum sharing (SBSS) market to facilitate Co-PSS where providers are explicitly incentivized to share spectrum resources. It focuses on minimizing freeriding in SBSS markets by introducing a novel game-theoretic and heuristic algorithm. It also proposes "Proof of Sharing (PoS)", an architecture to account spectrum sharing. This work extends Co-PSS to two new models with government infrastructure and spectrum as rewards. Finally, it demonstrates how to utilize PoS equivalent crowdsourced data to predict cellular tower locations which help to generate a truthful coverage map.

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The public is welcome to attend.