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January 26, 2012

Via Electronic Filing
Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

Notice of Oral *Ex Parte* Communication

RE: *In the matter of Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licenses:* **WT Docket No. 10-153**; *Petition for Rulemaking filed by Fixed Wireless Communications Coalition to Amend Part 101 of the Commission's Rules to Authorize 60 and 80 MHz Channels in Certain Bands for Broadband Communications:* **RM-11602**

Dear Ms. Dortch:

On Jan. 25, 2012, on behalf of Clearwire Corporation ("Clearwire"), George Harter, Christiaan Segura, Bob Hopkins (via phone) and I met with the following members of the Wireless Telecommunications Bureau ("WTB") Broadband Division: Blaise Scinto, Division Chief, John Schauble, Deputy Division Chief, Stephen Buenzow, Deputy Division Chief, Brian Wondrack, Attorney, Charles Oliver, Attorney and Chris Andes (via phone), Engineer. Melissa Tye, WTB Legal Advisor, also attended the meeting.

During the meeting, the participants discussed the attached presentation. The Clearwire representatives explained that Clearwire's deployment of an advanced microwave backhaul network resulted in increased speed to market, significant operating expense savings and carrier grade reliability. We also explained how the network's advanced ring topology allows for diverse traffic routing, protecting Clearwire customers from experiencing network outages. We reiterated the points made in our comments and reply comments in the proceeding supporting the use of smaller antennas in the 6, 18, and 23 GHz bands and wider channels in the 6, 11, 18, and 23 GHz bands. Finally, as discussed it our comments and reply comments we asked that the Commission take into account network topology as it sets payload requirements for wider bandwidth channels.

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, notice of this *ex parte* communication is being filed electronically. If you have any questions regarding this matter, please do not hesitate to contact the undersigned at 202-351-5033.

Sincerely,

By: /s/ Cathleen A. Massey

cc: Meeting participants

Clearwire

Wireless Backhaul

January 25, 2012

Clearwire Background

- Clearwire operates open, Internet Protocol ("IP") 4G wireless broadband networks that reach 130 million people in the U.S.
  - Clearwire is the leader in WiMAX 4G, currently the leading 4G standard in the world and has announced plans to deploy LTE Advanced
- As the country's first, greenfield 4G provider, Clearwire specifically designed its backhaul strategy for the demands of 4G mobile broadband
- Clearwire operates the largest wireless backhaul network in the U.S.
  - Clearwire uses microwave backhaul for more than 90% of its cell sites

Clearwire's Microwave Backhaul Network

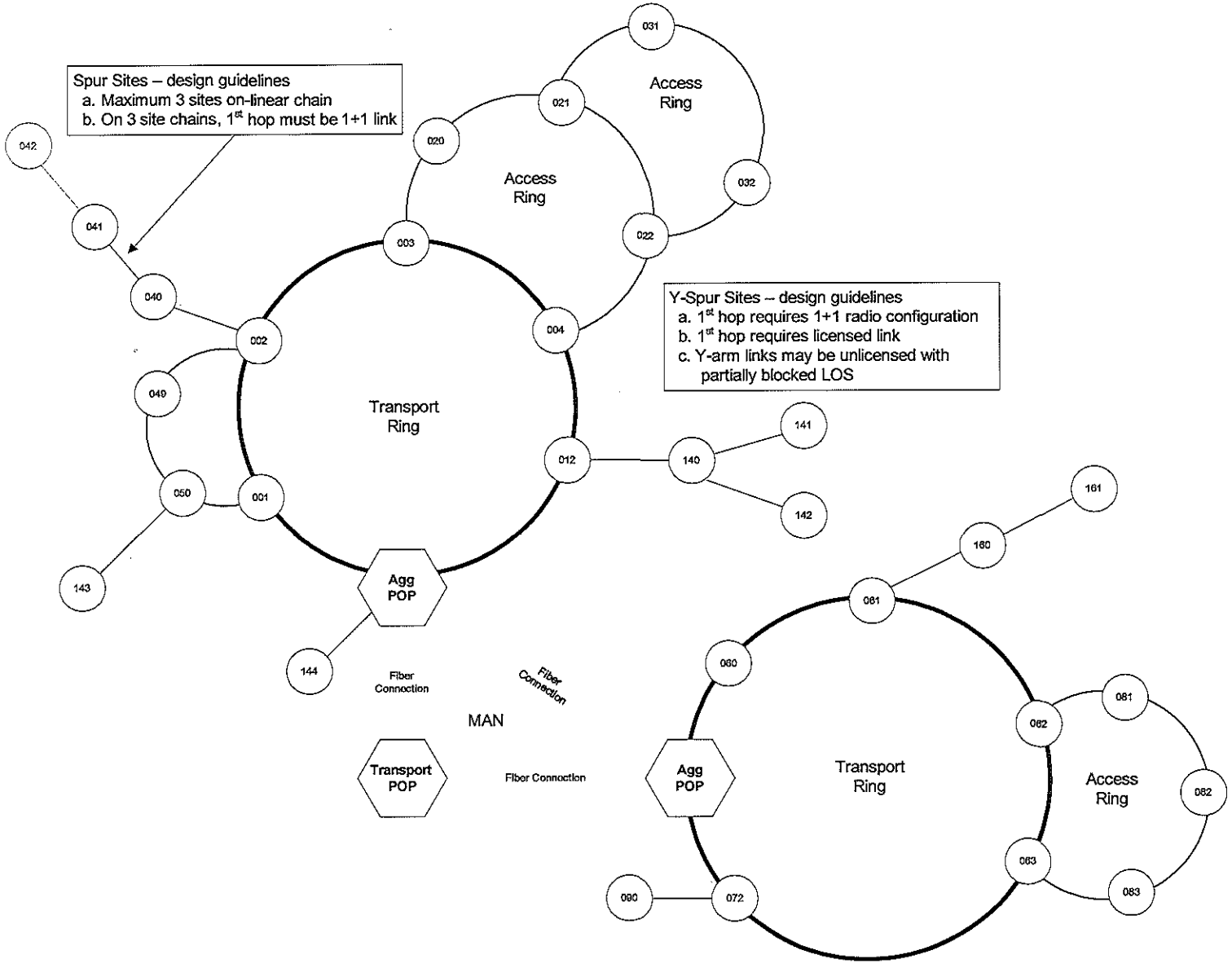
- Packet-based, all-IP solution to ensure greater efficiency and compatibility with next generation applications and services
- High capacity and scalability
- Low latency supporting real-time applications, including voice and video over IP
- Rapid deployment
- Carrier-grade reliability utilizing advanced ring architecture
  - Ring topology provides 99.999% network availability by providing redundant traffic routing from every cell site location

Clearwire Microwave Backhaul Network

- Design and Operations Criteria:
  - Design objective - 100% microwave backhaul network
  - Backhaul network uses high-speed, high-capacity Ethernet microwave radios at multiple frequencies to meet design objectives
  - Cascaded ring topology provides 99.999% network and service availability
    a. Transport Rings (TR) – primary backbone ring
    b. Access Rings (AR) – used to extend coverage in market
    c. Spurs – limited line of sight (LOS) or a partially blocked LOS sites
  - Diverse traffic routing using PBT (PBB-TE) from every site
  - QOS implemented on backhaul network to manage traffic when links congest
  - PTP microwave links designed to maximum capacity link capable of carrying given frequency, antenna diameter, path length, and rain zone
    a. 100 mbps injected into backhaul network per cell site
    b. 2:1 over-subscription
  - Minimum 99.995% availability per PTP link
  - Traffic aggregated from multiple microwave rings at a series of POPs
    a. Transport POP – aggregates all traffic for transport for Internet Access
    b. Agg POPs – aggregates microwave traffic from multiple TR/AR rings

Clearwire

Clearwire Microwave Backhaul Network



Use of Smaller Antennas

- Clearwire supports the Commission's proposal to permit the use of smaller antennas in the 6, 18, and 23 GHz bands
  - Provides for more flexible deployment options (stealthing, loading)

- Clearwire endorses Comsearch's technical analysis and recommendations for:
  - High-performance 3-foot diameter antennas in the 6 GHz bands
  - High-performance 1-foot diameter antennas in the 18 GHz bands
  - High-performance 8-inch diameter antennas in the 23 GHz bands

- Use of small diameter antennas will significantly increase number of site/tower candidates as well as reduce deployment costs
  - Smaller diameter antennas help overcome negative public perception and landlord resistance to microwave antennas

Wider Channels

- Clearwire supports Fixed Wireless Communications Coalition's (FWCC) proposal for allowing Fixed Service operators to combine 30 and 40 MHz channels in the 6 and 11 GHz bands
  a. Wider channels provide increased capacity on longer path length backhaul links at any given modulation rate
- Clearwire proposes that the Commission also allow operators to combine channels in the 18 and 23 GHz bands
  a. To achieve gigabit link capacities Clearwire has deployed over 1,100 millimeter wave links at 80 GHz
  b. Clearwire also deploys 2+0 radio configurations in the 11, 18, and 23 GHz bands to achieve gigabit link capacities
- Channel aggregation in the 11, 18, and 23 GHz bands provides:
  a. More design flexibility and capacity management
  b. Lower cost deployment options for multi-gigabit capacity links
  c. Reduced operational costs and impacts (QOS, configuration, AAM, etc)

Minimum Payload Requirements

- Commission should set minimum payload requirements to account for increased capacity available with wider bandwidth channels
- Any new minimum payload capacity and loading requirements should take into account network topology as well as "pure" link capacity
  a. Must be flexible to fully accommodate differing network topologies (advanced ring vs. linear topologies) necessary to support today's existing and future 4G broadband networks
  b. Operational need and channel availability
- Clearwire supports specifying 101.141 payload capacity vs. channel bandwidth requirements based on:
  a. IP traffic engineering and network topologies rather than telco (T1, DS-3, or STS-1) capacities and topology limitations
  b. Payload capacity requirements…. "be met within 18 months after construction notice (CN) filed for each link"
  c. Recognizes advanced network topologies, and subscriber and traffic growth after link becomes operational

Thank You