CLAIMS

1. A spectral network system for transmission and reception of multi-band RF signals over a packet-switched network, comprising: a down sampler configured to extract at least one smaller bandwidth channel from a larger bandwidth channel, and convert the at least one smaller bandwidth channel into at least one spectral channel, the at least one spectral channel being a digitized representation of the at least one smaller bandwidth channel; a packet encoder configured to encapsulate the at least one spectral channel as encoded packet data, each packet of the encoded packet data including a time of creation (TOC) based on a global time reference and configured for transmission via the packet switched network; a packet decoder configured to decapsulate and reconstitute the at least one spectral channel and to provide deterministic latency control of the transmission and reception of the multi-band RF signals based on the TOC of each packet; and an up sampler configured to convert the at least one spectral channel into the multi-band RF signals and insert the at least one smaller bandwidth channel into the larger bandwidth channel.

2. The device of claim 1, wherein the packet encoder encapsulates the at least one spectral channel into ANSI/VITA-49 Radio Transport Standard (VRT) packets.

3. The device of claim 2, wherein the packet encoder implements and manages the at least one spectral channel using Packet Forward Error Correction (P-FEC) techniques.

4. The device of claim 3, wherein the packet encoder is further configured to add the P-FEC techniques to the VRT packets by arranging the VRT packets into interleaved parity groups.

5. The device of claim 2, wherein in-phase and quadrature samples of the VRT packets are inserted into the at least one spectral channel with unused bits between the samples.

6. The device of claim 5, wherein each in-phase and quadrature sample is a fixed-point signed number, and a number of bits per sample is adjustable based on a signal-to-noise ratio required by processing equipment at a remote destination.

7. The device of claim 2, wherein the packet decoder is further configured to decapsulate and decode the encapsulated and encoded message data using a VRT parity packet for each of a plurality of groups of VTR packets.

8. The device of claim 1, further comprising an automatic failover unit including at least one of a passive splitter and a passive combiner, wherein the passive splitter is configured to split the at least one spectral channel into a plurality of source signals for diversity.

9. An apparatus for transmission and reception of multi-band RF signals over a packet-switched network, the apparatus comprising: means for converting one or more radio frequency signals into at least one spectral channel, the at least one spectral channel being a digitized

representation of the one or more radio frequency signals; means for encapsulating the at least one spectral channel as encoded packet data, each packet of the encoded packet data including a time of creation (TOC) based on a time reference to preserve timing for the converted radio frequency signal during transmission via the packet switched network; means for transporting the radio frequency signal as the internet protocol packets via a terrestrial packet switched network; means for decapsulating and reconstituting the at least one spectral channel to provide deterministic latency control of the internet protocol packets based on the TOC; means for converting the internet protocol packets into the one or more radio frequency signals.

10. The apparatus of claim 9, wherein the terrestrial packet-switched network comprises a radio transport standard including an ANSI/VITA-49 standard.

11. The apparatus of claim 9, further comprising means for seamless switching of data streams between different antenna and modem equipment to support antenna and processing site diversity.

12. The apparatus of claim 9, further comprising means for converting from internet protocol to analog for one of legacy modems or spectrum analysis.

13. The apparatus of claim 9, further comprising means for at least one of splitting, recombining, and moving of the multi-band RF signals between different sources, destinations and frequencies.

14. The apparatus of claim 9, further comprising means for performing packet forward error correction.

15. The apparatus of claim 9, further comprising means for providing digitized representations of a slice of a multi-band RF spectrum.

16. The apparatus of claim 15, further comprising means for characterizing the means for providing digitized representations by a center frequency and a bandwidth.

17. The apparatus of claim 15, further comprising means for subdividing the means for providing digitized representations into at least one smaller bandwidth channel.

18. The apparatus of claim 17, wherein the means for subdividing comprises means for extracting the at least one smaller bandwidth channel from a larger bandwidth channel.

19. A method for transporting radiofrequency (RF) signals over a packet-switched network, the method comprising: receiving, at a first spectral network device, an RF transmission from a spectral channel source, the RF transmission having a bandwidth and two or more RF signals spanning one or more RF spectra, the two or more RF signals comprising message data, the

message data having one or more analog RF signals; extracting a first RF signal and a second RF signal of the two or more RF signals from the RF transmission, the first RF signal and the second RF signal comprising less than the bandwidth; converting the first RF signal in into a first spectral channel as a digitized representation of the first RF signal and the second RF signal into a second spectral channel as a digitized representation of the second RF signal; encapsulating the first spectral channel and the second spectral channel as encoded packet data using packet forward error correction (P-FEC), each packet of the encoded packet data including a time of creation (TOC) based on a global time reference and configured for transmission via the packet switched network; transmitting, by the first spectral network device, the encoded packet data to at least a second spectral network device via the packet-switched network; and decapsulating and reconstituting the first spectral channel and the second spectral channel at the at least a second spectral network device; and converting the at least one spectral channel into the one or more multi-band RF signals.

20. The method of claim 19 further comprising: inserting the at least one smaller bandwidth channel into the larger bandwidth channel; and providing deterministic latency control of the transmission of the first spectral channel and the second spectral channel from the source to the sink, based on the TOC of each packet.