Interference Mitigation

Extreme Interference Protection (XIP™) Enables Carrier Grade Mobile Backhaul Performance in Unlicensed Spectrum

Fastback NETWORKS™
intelligent wireless transport

New requirements for higher levels of backhaul performance in the emerging LTE mobile network require more spectrum for backhaul. In the past, unlicensed bands have been only occasionally used for carrier grade mobile backhaul because available equipment could not effectively mitigate significant interference. Now, application of advanced technology has enabled the Fastback Intelligent Backhaul Radio (IBR™) to sustain the high throughput and low latency service requirements of LTE backhaul while simultaneously mitigating even severe levels of interference.

Advanced Technology: Co-existence with Severe Interference

Innovative application of the latest in RF technology, software defined radio (SDR) chips, proprietary signal processing, and antenna arrays enable the IBR to tackle the interference challenge. The IBR combines this signal processing power, SDR functionality, and a unique antenna array for 8-way receive diversity that provides multiple looks into any interference-laden channel. The IBR has the intelligence to examine interference simultaneously in the four domains of frequency, time, space, and cancellation. With millisecond (ms) level agility amongst these four domains, the IBR analyzes the instantaneous interference and continuously iterates to the optimal receiver configuration to mitigate even severe interference.

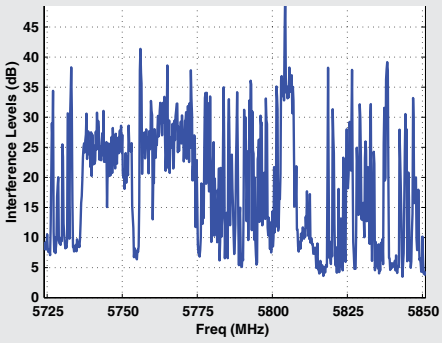
Extreme Interference Protection (XIP™)

- Adaptation of channel bandwidths (ms level)
- Frequency agility (ms level) over 580 MHz spectrum
- Spatial agility (ms level), 8 spatial receiver views
- Re-transmission (sub ms level) of interfered blocks
- Cancellation of dominant interferers
- Independent optimization of up and down links

IBR Carrier Class Performance: 550 Mbps Urban NLOS Link in Severe Interference

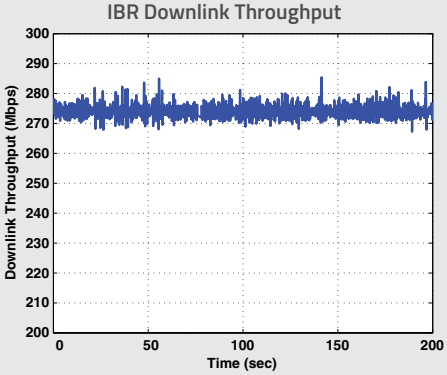
Results from field testing in an urban setting reflect XIP capability to mitigate severe interference. Despite interference in both uplink and downlink, the IBR sustained high performance throughput in NLOS conditions.

Frequency Domain: Downlink Interference



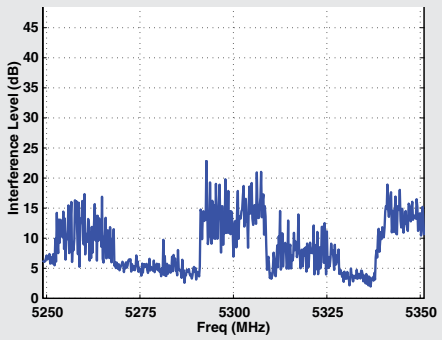
Maximum Interference Level at Receiver above the Noise Floor in a typical 1 second period

IBR Downlink Throughput



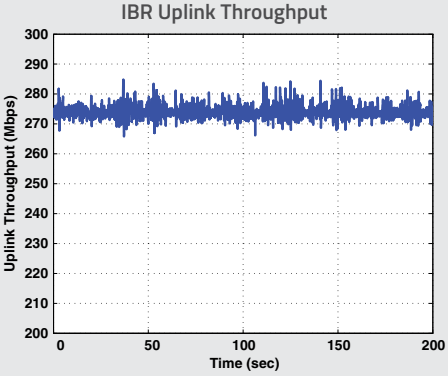
Measured throughput by Ixia Chariot over 200 sec

Frequency Domain: Uplink Interference



Maximum Interference Level at Receiver above the Noise Floor in a typical 1 second period

IBR Uplink Throughput



Measured throughput by Ixia Chariot over 200 sec

True Interference Mitigation Unleashes 5 GHz Spectrum

With 580 MHz of available spectrum, the 5GHz unlicensed bands are well matched to support the LTE backhaul performance requirements of 100 Mbps moving to 1Gbps per emplacement in the near-term future all at end-to-end latencies of well below 1 ms. The channel bandwidths required to support this level of performance (such as 20, 40, or 80 MHz) require more spectrum than is available in alternative bands, such as 2.4 GHz and 3.65 GHz. The 3.65 GHz band suitability for LTE backhaul is also hindered by satellite earth stations exclusion zones in the US, and channelization and protocol restrictions. In addition to the 15 times greater spectrum availability versus other alternatives, the 5 GHz band has no channel or geographic restrictions, easily manageable protocol restrictions, and growing global usage.

Although licensed mobile access bands below 3 GHz are technically well suited for LTE backhaul as well as mobile access, the use of these bands for backhaul limits full monetization of this precious access spectrum. And Part 101 licensed microwave bands have regulatory equipment specifications not suitable for the NLOS mobile backhaul capabilities required to support backhaul of small cell emplacements. The use of advanced technology to effectively mitigate interference is a pivotal breakthrough for unleashing unlicensed spectrum for carrier grade LTE backhaul. As mobile data communication continues exponential growth, more co-existence in uncoordinated and unlicensed spectrum will be inevitable.

Extreme Interference Protection (XIP™)

XIP, Fastback's patented capability for mitigating the effects of un-coordinated interference, enables new applications for unlicensed spectrum to macrocell and small cell backhaul. XIP–based IBRs provide sustained, carrier grade performance in unlicensed spectrum to a service level agreement (SLA). This functionality unleashes new levels of certainty and reliability, along with the advantages of tapping hundreds of MHz of available 5 GHz spectrum to relieve the capacity constraints of other bands.

Spectrum Options For LTE Backhaul

Comparison of Lightly-Licensed and Unlicensed Bands

Attribute/Band	2.4–2.4835 GHz	3.65–3.70 GHz	5.15–5.925 GHz
Available Bandwidth for Wireless Backhaul	83.5 MHz	50 MHz (but may be eliminated)	580 MHz Now 775 MHz Expected
Channelization Restrictions	None	25 MHz	None
Protocol Restrictions	None	25 MHz — none 25 MHz — Listen before Tx	225 MHz — None 355 MHz — Radar detect
Transmit Power	Conducted: +30 dBm EIRP: No limit (P2P)	Conducted: N/A EIRP: +43 dBm	Conducted: +23 to +30 dBm EIRP: +30 dBm to no limit
Global Equivalence to FCC	Good and improving	Minimal	Varies but improving
Current Usage Density	Significant	Light	Varies but increasing
Geographic Restrictions	None	Not allowed at < 150 km from designated locations, impacts 50% US population	None

About Fastback Networks

Fastback Networks was founded with a vision to deliver innovative technology for the mobile infrastructure of the future, enabling network operators to deliver new services, tap new markets and monetize a new generation of mobile applications. With insights derived from the collective team's vast experience building leading edge radio and data networking solutions, Fastback Networks looked at the challenges of 4G/LTE deployment with fresh eyes and better ideas, and developed a transformational solution that enables the acceleration of next generation mobile services. Fastback Networks is funded by Foundation Capital, Granite Ventures, Harmony Partners, Juniper Networks Junos Innovation Fund, and Matrix Partners.

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