

Introduction

Worldwide, wireless service providers are confronted with the challenge of twisting as much capacity from their RF spectrum and the radio access network as possible to satisfy the growing volume of voice and data traffic. Adding to the complexities are the transitions from 3G to 4G causing more stress on the 3G networks since vital funds to increase capacity are funneled to 4G deployment.

Numerous Approaches for Delivering Capacity

As a recent article in Fierce Wireless written by Monica Paolini, [“Where will an increase in cellular capacity come from?”](#) shows, delivering more capacity can come from numerous approaches. Two of these, Network optimization and More spectrum, require assuring the RF physical layer is performing optimally and free of physical layer impairments. When combined with two other RF-dependent approaches, More spectrally efficient air interfaces such as LTE and Adding more macro base stations, it's clear that 61% of the tools to increase network capacity require the RF to perform exceptionally. In all of these cases, an unconditioned RF physical layer means LTE will perform at less than optimal data rates and new base stations will not carry maximum traffic loads, leaving behind valuable capacity. Spectrum conditioning offers a simple, quick and cost effective approach to maximize the capacity utilization of 3G and 4G networks.

The Benefits of Spectrum Conditioning; Speed, Utilization and Performance

The value and benefits of deploying spectrum conditioning will vary from situation to situation. For example, as outlined by the [ISCO Value Model](#), applying spectrum conditioning to the highest traffic sites can recover lost spectrum and increase capacity available to carry traffic. The benefit for this application is obvious – more capacity -- and the payback is well within 12 months as measured by increased MOUs and data throughput.

What are the best tools for mobile operators to increase network capacity and meet subscriber traffic demand?

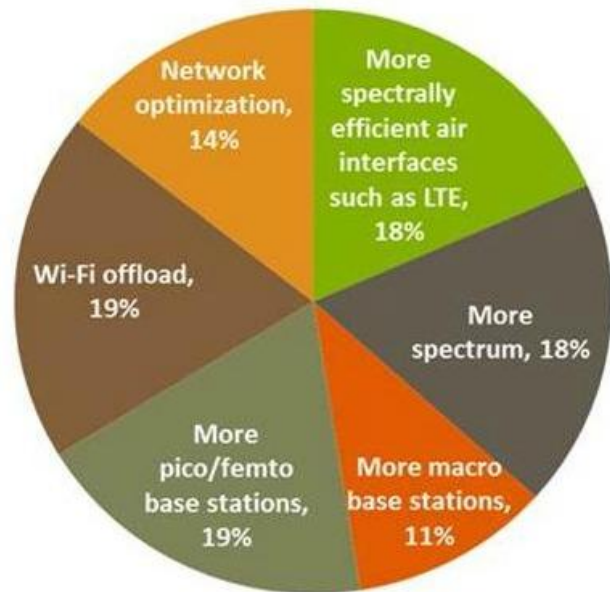


Figure 1. Survey Results (Source: Senza Fili Consulting)

The Benefits of Spectrum Conditioning

	Improve and Protect Performance	Recover Lost Capacity	Increase Coverage	Add Incremental Capacity
Increase cell site sensitivity; improve C to I while reducing mobile Tx power	X	X	X	
Eliminate impact of BDAs in coastal areas	X	X	X	
Mitigate Co-Channel GSM; border areas and UMTS transition zones	X	X	X	
Condition and protect the performance of mobile cell sites (CoW/CoLT)	X	X	X	
Condition high-traffic sites in dense areas removing impact of adjacent RF	X	X		
Mitigate conflicting frequency allocations along borders	X	X		
Reduce guard bands while maintaining design rules - more carriers	X			X
Condition DAS networks to manage near-far effect	X			
Maintain and possibly Increase data rates by improving SNR	X			

Table 1. The Applications and Benefits of Spectrum Conditioning

For other applications the benefits could be the reduction of dropped calls or the increase in coverage area or accessibility. Table 1 summarizes a few of the applications for spectrum conditioning and the four basic benefits that will be realized.

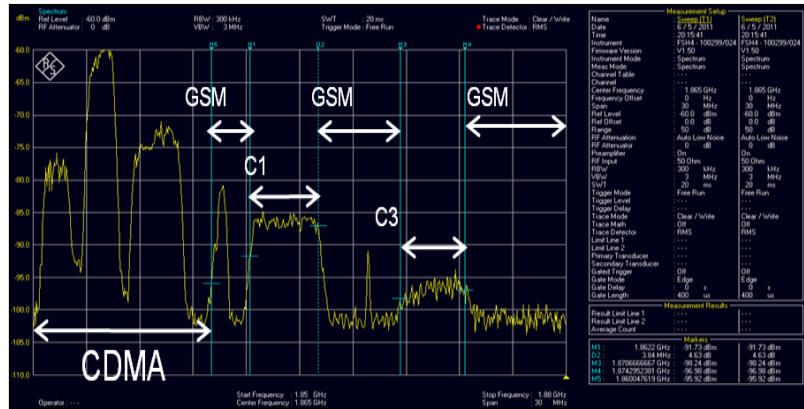
ISCO's Spectrum Conditioning Solution

Implementing spectrum conditioning is more than just adding equipment. It is a combination of equipment, information and expert analysis delivering the best C to I, SNR and ACS available on a consistent basis.

ISCO's spectrum conditioning solution consists of three components:

1. **Spectrum conditioning equipment;** Proteus® and other RF grooming equipment.
2. **Performance information and spectral data;** using ISCO's SpectrumView Plus and other industry measurement tools.
3. **Expert analysis and implementation;** ISCO RF engineers use findings to propose a solution, implement the solution and then prove out the resulting benefits.

A typical engagement starts with understanding the current situation and objectives. The situation includes reviewing current KPIs, available spectrum plots, known challenges and timing. The objectives can be many, but typically include increasing MOUs, reducing dropped calls, reducing channel power (RSSI or RTWP), increasing offered traffic and increasing data throughput.



The challenges can be numerous. They can include high channel power, adjacent high power RF, known spectral conflicts along borders and market boundaries and DAS near-far effects. With this information a project plan, timeline, required data and resources can be defined by ISCO project management.

In a recent spectrum conditioning engagement the challenges were numerous and resulted in a variety of recommendations that

included tuning of existing equipment along with the deployment of ISCO Proteus digital signal processing equipment to condition the spectrum. Figure 2a is a typical spectral plot captured during the data gathering and discovery phase of the engagement. Figure 2b is another sample of a different engagement. In both of these cases co-channel interference, high-power adjacent RF, border conflicts and higher than normal channel power were all present and needed to be addressed.

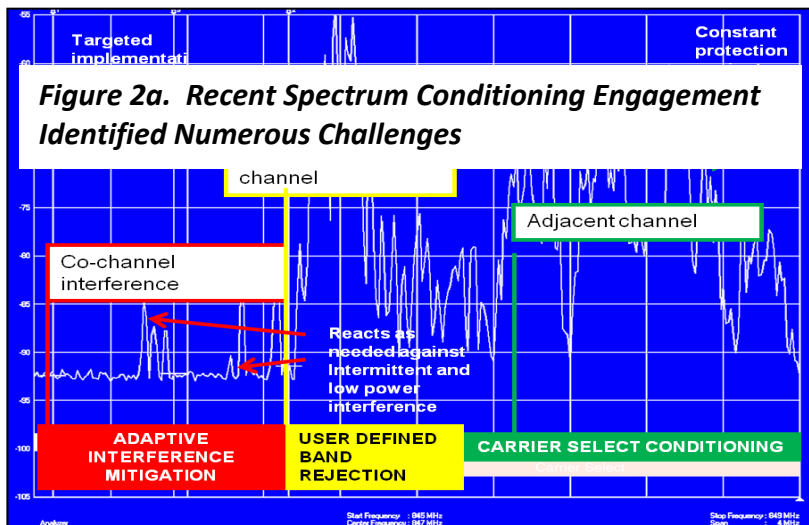


Figure 2b. Spectrum Conditioning Reveals Multiple Challenges to be Addressed

Spectrum Conditioning at Work

Establishing a project plan with a timeline and clearly defined success criteria is critical to success. Everyone is busy so there is no extra time to be guessing about requirements, needed resources and what will be deemed as success. Upfront, there is agreement about the following:

1. Information required about the network and timing for delivering such information.
2. Resources required to support ISCO information collection and discovery activities.
3. Success criteria; the measures of success are defined and the target improvement goals established.
4. Implementation and proof of value timeline.

Along the way ISCO will present findings and recommendations. Upon completion after equipment has been installed and findings from the before and after analysis are complete, ISCO will present a final proof of value analysis. This analysis is intended to provide the customer the required justification to purchase the installed solution and set the stage for discussion about a wider deployment of spectrum conditioning.

Contact ISCO

Experienced ISCO RF engineers on staff are available to engage with your radio access network performance and field engineers to deliver the best spectrum conditioning solution possible for your wireless network. The results can include higher data rates, greater data throughput, fewer dropped calls and better spectrum utilization delivering more capacity to carry traffic.

About ISCO International

ISCO International has become the leader in spectrum conditioning by proving that it improves the subscriber experience and by demonstrating the financial value that can be realized for 3G and soon 4G wireless operators. Spectrum conditioning enables

service providers to squeeze all available capacity from their network assets by maximizing spectrum utilization. ISCO's PurePass™ digital signal processing technology continuously identifies and counteracts the many types of co-channel and adjacent interference that cause "physical layer impairments". With PurePass, wireless operators protect themselves from a significant degradation of uplink performance, which would negatively impact the entire wireless experience.

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