

May 25, 2007

**To: Director General
Telecommunications Policy Branch
Industry Canada
1612 A, 300 Slater St.
Ottawa, On KIA 0C8**

**SR Telecom submission responding to:
Canada Gazette, Part 1, February 24, 2007
Department of Industry
Radiocommunications Act**

**Notice- No, DGTP-002-07 – Consultation on a Framework to
Auction Spectrum in the 2 GHz Range including Advanced
Wireless Services.**

May 25, 2007

Mr. Leonard St-Aubin
Director General
Telecommunications Policy Branch
Industry Canada
1612 A, 300 Slater St.
Ottawa, On KIA 0C8

RE: **Submission responding to: Canada Gazette, Part 1, February 24, 2007**
Department of Industry, Radiocommunications Act

Notice- No. DGTP-002-07 – Consultation on a Framework to Auction Spectrum in the 2 GHz Range including Advanced Wireless Services.

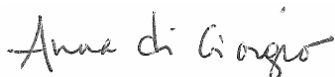
Dear Mr. St. Aubin:

SR Telecom, a Canadian company and leading supplier of broadband wireless access solutions is pleased to submit its comments to the “Consultation on a Framework to Auction Spectrum in the 2 GHz Range including Advanced Wireless Services.”

SR Telecom’s submission is intended to provide an overview of the company’s research and development in advanced wireless services, specifically WiMAX, current market opportunity for fixed WiMAX 802.16d solutions, and our spectrum strategy. Information on our spectrum strategy is provided at a high level, however some of this information responds directly to questions raised by the AWS spectrum consultation.

We trust this submission contributes to Industry Canada’s deliberations on spectrum for advanced wireless services. We are open to any questions you may have. Please do not hesitate to contact me at 514.335.1210, extension 4605 or anna_digiorgio@srtelecom.com; or SR Telecom’s Government Affairs Advisor Joanne Kennedy at 514.235.4380 joannekennedy@videotron.ca.

Sincerely,



Anna di Giorgio
Vice-president -Communications
SR Telecom Inc.

SR Telecom Comment

Introduction

SR Telecom is pleased to submit comments to Industry Canada in response to its February 24, 2007 public “Consultation on a Framework to Auction Spectrum in the 2-GHz range, including Advanced Wireless Services”. SR Telecom is one of the few original equipment manufacturers (OEM) in Canada, producing broadband wireless access products and to have gained international recognition. With increasing concentration in Canada’s telecommunications market, the viability of independent Canadian OEMs such as SR Telecom is critical to ensuring carriers and enterprises have a meaningful choice of Canadian alternatives for advanced telecommunications equipment.

Since its foundation in 1981, SR Telecom has provided carrier-class wireless access systems to carriers, governments, and industry and has deployed close to 2 millions lines in 110 countries, including full turnkey solutions. SR Telecom has maintained a consistent record of success and customer-focus that is respected by its international customer base.

In 2003, the company made a seismic shift within the wireless access business to direct its attention away from narrow-band voice services to emerging wireless broadband services. In its most recently reported earnings, SR Telecom derived nearly 100% of its revenues from broadband,

Major SR Telecom Projects

Thailand: \$300 million
Philippines: \$200 million
China: \$100 million
Saudi Arabia: \$100 million
Canada (rural): \$100 million

largely due to OFDM, pre-WiMAX technology. Today, SR Telecom supplies some of the world’s largest broadband wireless players with 25 commercial networks in place and counting, including industry-leading corporations such as Telmex, Telefónica and Axtel. From 2007 going forward, WiMAX technology will be at the forefront of SR Telecom’s product roadmap.

In the following pages, we focus on three areas that are of key concern to SR Telecom. First, we address SR Telecom’s shift in business from its legacy products to WiMAX. Second, we discuss world market trends. We demonstrate the importance for many carriers to adopt fixed WiMAX immediately, to respond to current needs, followed by a strategy to upgrade to mobile WiMAX later. And third, we describe SR Telecom’s spectrum strategy.

In the last case, we have identified two questions from the consultation paper that are relevant to SR Telecom, “Blocks of Spectrum” and “TDD/FDD Equipment”, and explain our position.

Investment in OFDM and R&D

SR Telecom’s metamorphosis to broadband and WiMAX was made possible through the purchase of San Jose, California-based Netro Corporation in April 2003. The company specialized in Orthogonal Frequency-Division Multiplexing (OFDM) providing the first great leap forward in carrier-grade wireless technology since the commercialization of CDMA by Qualcomm. With Netro came one of the world’s most valuable research assets in OFDM.

One of Netro’s products was Angel, an OFDM-based product previously acquired from AT&T. SR Telecom was keenly interested in Angel’s OFDM platform, which was an underlying new standard being studied at the time by the Institute of Electrical and Electronics Engineers (IEEE) under the name of WiMAX. Angel was effectively a precursor of the 802-16 standard that was ratified by the IEEE in June 2004.

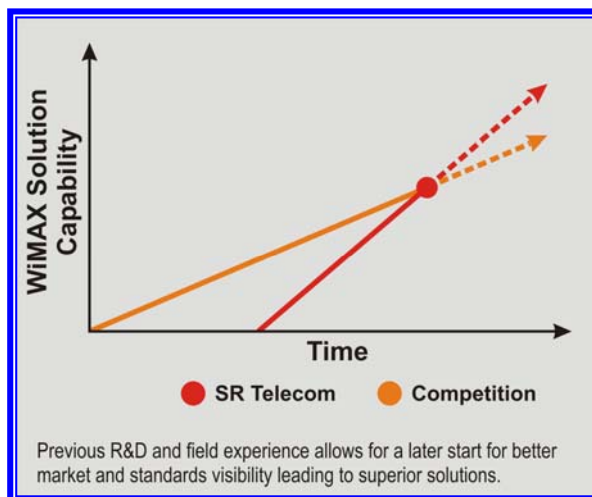
The OFDM Saga

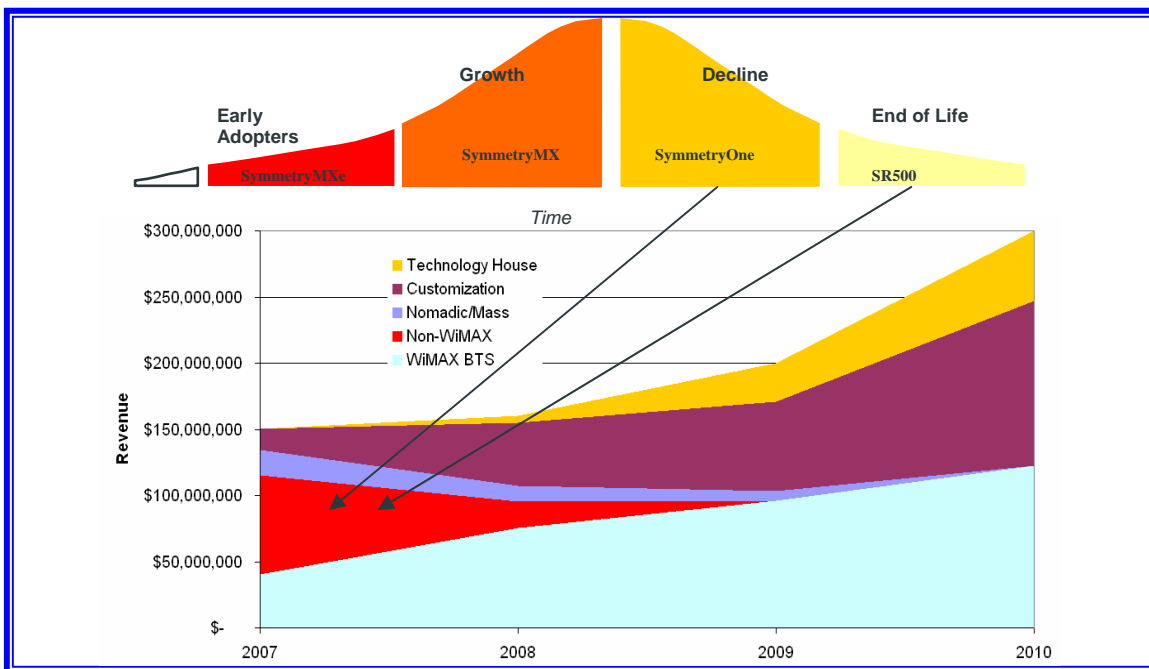
Initial OFDM research was launched by McCaw Cellular Communications in 1995. McCaw needed fixed wireless in the Seattle area and assembled the initial team of engineers. This was the same year the multi-billion dollar merger between AT&T and McCaw took effect, and the research continued under an AT&T umbrella. In 1998, the first OFDM field trial took place in Texas and the following year full deployment began. Ten cities were equipped with AT&T fixed wireless solutions. In 2000, AT&T split and AT&T Wireless was created. The new company decided to stop all manufacturing operation to focus on its service provider role and sold the OFDM division to Netro in January 2002.

The acquisition of AT&T’s “Project Angel” team, products, and technology from Netro provided SR Telecom with a vast legacy of advanced-OFDM broadband development. As a result, SR Telecom today offers the most advanced WiMAX solution in the industry.

The Netro acquisition coincided with the decline of SR Telecom’s traditional markets. Its state-owned, monopoly clients in emerging countries were privatized. Their obligation to deliver basic services in rural areas faded away. Moreover, the proliferation of cellular networks limited the need for wireless access services. Subsequently, SR Telecom’s narrowband projects sharply declined. The choice was clear: focus exclusively on WiMAX.

SR Telecom complemented its acquisition of Angel with a massive investment in R&D: \$ 21.0 million in 2006 out of \$87.5 million consolidated revenue – i.e. 24% of its revenue. Angel was renamed **symmetryOne**. A new product, entirely WiMAX-compliant, called **symmetryMX** was developed and is now being marketed (Q2 2007).





In 2007, more than 50% of SR Telecom’s revenue will come from narrowband technologies or pre-WiMAX product lines. In 2008, this revenue will represent less than 15%. How can SR Telecom achieve such a fast transition? Basically by being the only company with a 12-year involvement in the OFDM technology that underlies the WiMAX standard. The total R&D invested by McCaw, AT&T, Netro and now SR Telecom, in OFDM since 1995 amounts to about \$1 billion – this is more than the WiMAX R&D undertaken by any other company, including tier-one OEMs.

The OFDM Team
 SR Telecom maintains more than 140 engineers devoted to WiMAX R&D.

Internal R&D

- Montréal, Québec headquarters: 100 engineers
- Seattle, Washington laboratory: 15 engineers

Outsourced R&D

- Taiwan: 15 engineers
- Redmond, Texas: 8 engineers
- Montréal, Québec: 4 engineers

The WiMAX advantage

The WiMAX advantage rests on OFDM technology, a digital multi-carrier modulation scheme, which uses a large number of closely-spaced orthogonal *sub-carriers*. Each sub-carrier is modulated with a conventional modulation scheme that is inversely related to the carrier frequency spacing so that sub-carriers have minimal mutual interference between them. In this sense the sub-carriers are “orthogonal” or independent from one another.

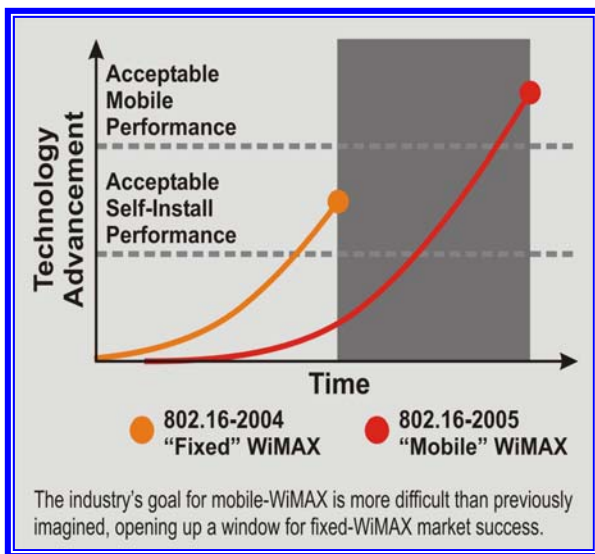
OFDM has been used successfully in wireline access applications, such as Digital Subscriber Line (DSL) modems and cable modems. The key advantage of OFDM over single carrier modulation

schemes is its ability to deliver higher bandwidth efficiency and therefore higher data throughput with more than 1 Mbps downstream and even higher data rates; this even in the face of challenging deployment scenarios such as non-line-of-sight (NLOS) links suffering from significant degradation due to multipath conditions. OFDM allows the signal to penetrate into buildings without too much degradation.

Why orthogonal?

In mathematics, orthogonal means at right angles. In computer science, orthogonality refers to the absence of side effect produced by a component on the other components of the same system. In wireless, multiple access schemes are orthogonal when the receiver can reject arbitrarily unwanted signals. Orthogonal frequency-division multiplexing (OFDM) breaks up the occupied spectrum into many discrete narrowband channels known as sub-carriers. Each data carrier is modulated over a symbol time that is inversely related to the carrier frequency spacing so that sub-carriers have minimal mutual interference between them. In this sense the sub-carriers are “orthogonal” or independent of one another. CDMA is non orthogonal, but WiMAX is.

WiMAX comes in two versions: 802-16d which was ratified by the IEEE in June 2004 and 802.16e which was approved in December 2005.¹ The basic difference between the two versions is that the “d” standard supports both fixed wireless and limited mobility, while the “e” standard will eventually support full mobility. According to the WiMAX Forum, the first lab trials of WiMAX “d” began in Q3 2005, followed by commercial trials. Fixed WiMAX networks based on WiMAX Forum Certified™ equipment began commercial deployment in 2006. Testing is currently underway for the first WiMAX “e” products.

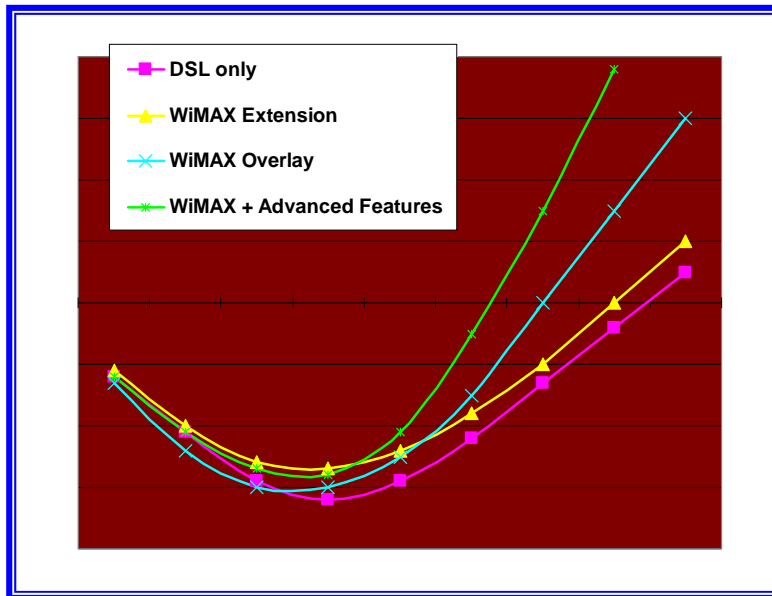


Mobile WiMAX is the long-term goal for many industry segments, but the majority of carriers and enterprises interested in WiMAX today are looking for fixed or nomadic wireless-based solutions as an alternative to wireline deployments or upgrades. Many clients are realizing that stable mobile WiMAX solutions are some years away and are looking to fixed WiMAX to enable them to enter the market quickly and capture market share. The industry itself is starting to realize that mobile WiMAX is a more difficult goal requiring significant levels of advanced technology that will extend availability of stable solutions with good performance before late 2009.

¹ 802-16d is at times designated as 802-16-2004 and 802-16d as 802-16-2005.

SR Telecom has bet on the second alternative since its current “d” WiMAX suite of solutions can immediately fulfill all fixed and limited mobility – or “nomadic” – needs and can be upgraded to full mobility later on when the “e” solutions are available, reliable and affordable.

WiMAX throughput is around 10Mbps which makes it an equivalent service to online DSL (as its shared actual speed for the end user usually varies between 1 to 3 Mbps). This makes fixed “d” WiMAX a perfect tool to connect people in emerging countries, rural western countries and large company campuses.



Moreover, carriers deploying fixed WiMAX will obtain a faster return on investment than those investing in DSL only, and will be able to offer advanced features to the end-user. Fixed WiMAX becomes not only the most efficient way to extend broadband services in unserved areas, but also a differentiator that allows carriers to anticipate the needs of an upscale clientele of “early adopters” by exploiting the nomadic advantage.

Several carriers in international markets are currently in the process of deploying fixed WiMAX now. The best signs of this are the field trials with SR Telecom customers initiated in November 2006 and continuing in 2007. These trials are considered as “beauty contests” where potential customers compare SR Telecom’s WiMAX offering to that of its competitors. While winning a beauty contest generally is not a guarantor of a future sale, winning one provides the company with an opportunity to see how it compares with world competitors in real-time.

TRIALS SHIPPED/ON GOING SINCE NOV. 2006

<i>Regions</i>	<i># Trials</i>
Latin America	4
Eastern Europe	3
Asia/Middle East	3
Canada	2

Once SR Telecom’s fixed WiMAX solution is deployed, operators can upgrade to “e” solutions when they are ready – at minimal risk and cost. SR Telecom’s *symmetryMX* solution provides a seamless upgrade path with software-based upgrades for all network elements, efficient broadcast software downloads for large-scale networks, and technical services to prepare and execute trouble-free migration.

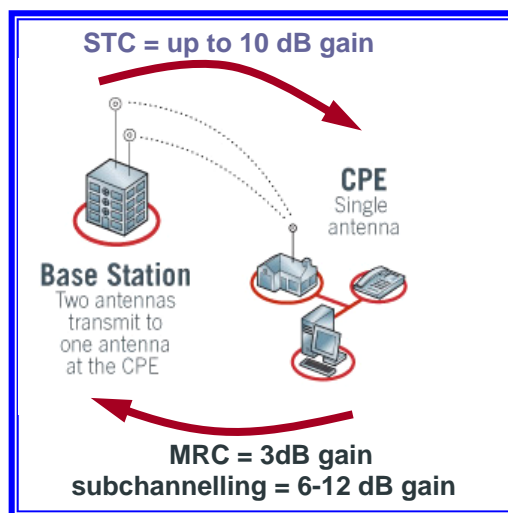
SR Telecom's WiMAX Product: *symmetryMX*

SR Telecom owns the major part of the hardware, software, and supporting tools of its first WiMAX solutions, which enables quicker technological advancement. SR Telecom is free from dependency on licensed software and algorithms from other vendors which can slow down product development and make it difficult to resolve issues quickly. As a result, SR Telecom has produced the *symmetryMX* suite, with the following characteristics:

- **Physical layer** –the highest link budget in the industry enabling the best indoor penetration and outdoor coverage range.
- **MAC layer** – the most complete implementation of WiMAX QoS for superior support of revenue-generating applications
- **Network management** – originally developed by AT&T, the *symmetryMX* network management system (NMS) is a carrier class system that has the features and capabilities required by large operators to integrate into their OSS and processes, like other large-scale technologies such as ADSL
- **Components** – a complete suite of base station and subscriber products including a highly space-efficient base station for carrier-class redundant deployments
- **Software upgradeable** – 100% upgradeable solutions from fixed to mobile WiMAX

The base station of *symmetryMX* is built on a high performance, high programmable platform that supports both WiMAX versions “d” and “e”. It encodes transmissions onto multiple antennas, which allows the customer premise equipment (CPE)² to identify the signals and combine them into one optimal signal. SR Telecom's *symmetryMX* is the only system on the market that is licensed to use this space time coding (STC) scheme.

Aside from a high-end outdoor CPE, SR Telecom does not develop its own embedded indoor CPE or portable mobile devices. Instead, it produces the software and out sources the production of various models of CPE to specialized manufacturers.



² A few words on CPE: SR Telecom does not develop its own embedded WiMAX in portable devices and WiMAX capable mobile devices. Instead, it produces the software (an improved reference design for Intel microprocessors) and outsources building the various models of outdoor and indoor CPE boxes to specialized manufacturers.

symmetryMX (Fixed WiMAX)	symmetryMXe (Mobile WiMAX)
802.16-2004 (OFDM256) <ul style="list-style-type: none"> • FDD, TDD • Available for 3.5 GHz frequency band (1.5GHz, 2.3GHz, 2.5 GHz, 3.5 GHz, 10.5GHz) • 1.75 MHz, 2.5 MHz, 3MHz, 3.5 MHz, 5 MHz, 5.5 MHz, 6 MHz, 7 MHz, 8.75 MHz and 10 MHz channel sizes (platform and bands dependent) • Adaptive modulation (64QAM, 16QAM, QPSK, BPSK) • FEC (Forward Error Correction): Reed-Solomon and Convolutional Coding • Subchannelization for 2, 4, 8 or 16 subchannels 	802.16e-2005 (SOFDM 128, 512, 1024) <ul style="list-style-type: none"> • FDD, TDD • Available for 1.5 GHz, 2.3G Hz, 2.5 GHz, 3.5 GHz, 10.5 GHz frequency band for fixed, nomadic or mobile deployments (platform and band dependent). • 1.75 MHz, 2.5 MHz, 3MHz, 3.5 MHz, 5 MHz, 5.5 MHz, 6 MHz, 7 MHz, 8.75 MHz and 10 MHz channel sizes (platform and bands dependent) • Adaptive modulation (64QAM, 16QAM, QPSK) • FEC (Forward Error Correction): Reed-Solomon and Convolutional Coding • Subchannelization for up to 32 subchannels

A Growing Market

The global WiMAX market is projected to be worth \$725 million in 2007. Based on an assessment of the spectrum allocation breakdown by region for BWA and WiMAX solutions, most revenue (if not margins) will come from the 2.5, 3.5 and 5.8 GHz bands.

Geographical Trends

Analysts predict WiMAX will become a predominant portion of the broadband wireless access market by 2009 because of the wide support it has achieved from leading equipment vendors. Currently, the Asia-Pacific region has the largest share in terms of WiMAX subscribers, attributed to large populations and the emerging nature of economies in the region. Other regions like Eastern Europe and Latin America are increasingly adapting to WiMAX technology due to lower broadband penetration level. In more developed regions like Western Europe, WiMAX adoption has been slow due to the high levels of broadband penetration. Finally, North America is by far the leading region in terms of the number of WiMAX licences, with a total of 394 WiMAX license holders.³

Industry Segmentation

There are three large categories of WiMAX users:

1. Incumbent local exchange carriers (ILECs)

ILECs in developed markets provide telephony services to remote populations at the same basic tariffs. A WiMAX network overlay for ILEC customers provides both voice and broadband services where subscriber density is low and/or where copper infrastructure is not sufficient for broadband service. It also provides to SMEs in remote areas advanced services such as ADSL, fractional T1 or redundancy services.

2. Competitive local exchange carriers (CLECs) and Internet service providers (ISPs)

CLECs that offer Internet and voice services using DSL are looking at ways to differentiate themselves from ILECs and other ISPs. SR Telecom can offer an alternative model – a nomadic play model using WiMAX as an overlay to a DSL network. Thanks to advanced features such as STC, a **symmetryMX**-enabled network makes indoor coverage a reality and

³ The report WiMAX - A Market Update (2006-2007), Research and Markets, Dublin, Ireland.

enables a self-install business model. For rural applications, throughput remains strong at long ranges.

3. Enterprise Services

Enterprises represent 15% of the WiMAX total market. They face challenges in filling specific requirements to support their mission critical operations, including needs for surveillance, metering and control (IP SCADA), IP backhauling and secured wireless VPN. To many enterprises, reliability and redundancy are very important. In particular, large enterprises need affordable IP connectivity for campus or utility outposts in remote or isolated areas, or for points of service and industrial sites distributed in a city.

SR Telecom's WiMAX solution delivers the most versatile QoS handling as a multi-services system and the best multimedia support. It also offers secure support of outpost backhauling.

Spectrum Needs

SR Telecom is a principal member of WiMAX Forum, so the company is fully aligned with the long-term objectives of the WiMAX industry. SR Telecom believes that true WiMAX performance will only be possible through the use of licensed spectrum.

What is the WiMAX Forum?

The WiMAX Forum is an industry-led, not-for-profit organization with more than 420 members comprising the majority of operators, component and equipment companies in the communications ecosystem. The WiMAX Forum goal is to certify and promote the compatibility and interoperability of broadband wireless products based upon the harmonized IEEE 802.16/ETSI HiperMAN standard (ETSI is the European equivalent of IEEE).

www.wimaxforum.org/

There is a general global consensus that favours the 3.5GHz band, which represents 36% of the total market. This is true except for North America, where this band is already in use. The 3.5 GHz however is not well suited for mobile or indoor applications. Therefore, 2.3 and 2.5-2.7 GHz bands will

be critical for the indoor and mobile applications, especially in the United States, which is forecast to be 18% of the total market.

SR Telecom and the Canadian Market

SR Telecom's **symmetryMX** product suite currently focuses mainly on 2.5 and 3.5 GHz spectrum (some pre-WiMAX products such as **symmetryOne** also use 1.5 GHz and 10.5 GHz). To adapt the 2.5 GHz **symmetryMX** solution to the specific band currently made available for auction by Industry Canada would require some modification to the **symmetryMX** radio. This would be a relatively simple task for SR Telecom's engineers.

Blocks of Spectrum

Ideally, a **symmetryMX** base station requires the use of 20 MHz made of four 5 MHz channels sufficient to reduce interferences to reasonable levels. However, three channels are generally sufficient to convey the signal. The current WiMAX network deployed by SR Telecom in Mexico is using three 5 MHz channels (15 MHz altogether). It is also possible to use 3.5 MHz channels depending on the data rate needed. In all cases, SR Telecom adapts its product to the needs of the client. The choice depends on the environment (rainy areas may use rather more bandwidth), the

density of population, and the radio activity taking place in the adjacent spectrum. North American rural network deployments usually require 15 MHz spectrum per base station.

TDD/FDD Equipment

SR Telecom equipment uses both frequency division duplexing (FDD) systems and time division duplexing (TDD). An FDD system will transmit and receive signals at the same time on different channels. For instance, full communication will use 10 MHz: 5 MHz on the uplink and 5 MHz on the down link. On the other hand, a TDD system will use a single channel of 5 MHz but transmits and receives at different times. One of the main advantages of TDD is that the system can allocate more bandwidth on the downlink and less on the uplink if needed. FDD however, may be interesting to deploy in a spectrum where TDD is heavily used. Historically, cellular systems have been FDD and Wi-Fi TDD.

The WiMAX “d” standard uses both FDD and TDD while the “e” standard uses TDD only. This explains why most of the industry is developing TDD only equipment. However, since SR Telecom has chosen to develop “d” standard networks, its equipment can accommodate both systems.

Conclusion

SR Telecom recognizes the inherent advantages to carriers and enterprises of deploying fixed WiMAX (802-16d) solutions today. Fixed “d” WiMax enables carriers to extend their broadband service to unserved areas as an alternative to DSL; to overlay DSL access network when congested; and to offer advanced features (nomadic play) to a clientele of early adopters.

The company has leveraged acquired OFDM R&D and technology and its own wireless expertise to develop premium WiMAX solutions; *symmetryMX* and *symmetry MXe*. Network extension and replacement market opportunity justify SR Telecom’s commitment to WiMAX. Products to be commercialized in the next 12 months include a 3.5 GHz version to suit prevailing spectrum world wide, and 2.5 GHz version to fill the needs of saturated areas (overlay approach) or to capture the upscale clientele of early adopters (nomadic approach). Other spectrum bands are also being considered based on carrier and enterprise interest.