

Spectrum Research Collaboration Programme

Mohd Redza Fahlawi shares how various parties are collaborating on research in radio spectrum management.

The rapid advancement in wireless communications requires more radio spectrum and fulfilling demand can be greatly helped by efficient spectrum management.

Realizing this, Malaysia's communications regulator, the Malaysian Communications and Multimedia Commission (SKMM) together with designated institutions of higher learning (IHL) have agreed to collaborate in research programs that seek to find the best ways to manage spectrum usages through the Spectrum Research Collaboration Program (SRCP).

The SRCP's purpose is to improve the administrative, regulatory and technical expertise of frequency management, by promoting and funding research on spectrum related matters in collaboration with selected IHLs and industry.

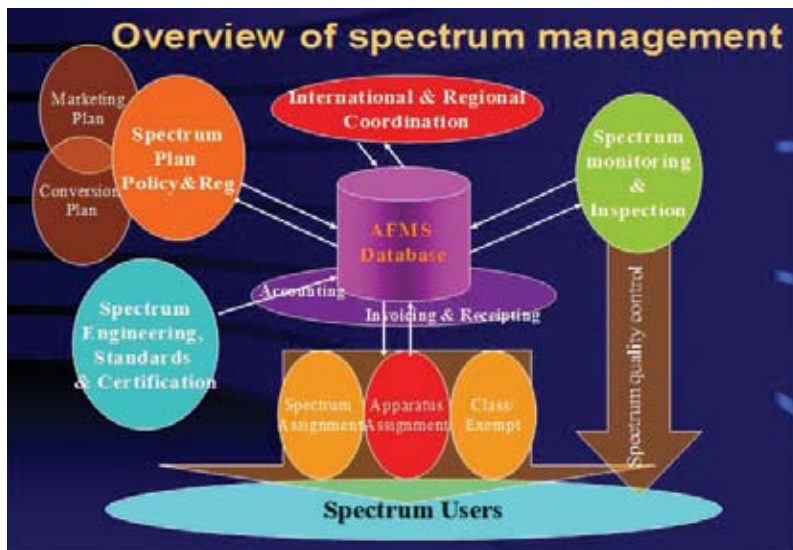
While the worldwide use of radio spectrum for different services is decided by international agreement at the World Radiocommunication Conferences (WRC), organized by the International Telecommunication Union every three to four years, each

member country still needs to set priority on its use based on its own national policy objectives. Balancing the spectrum needs of various parties or services based on demands from for example defense, government and public safety, private, leisure and commercial services is complex and requires high level of expertise and foresight.

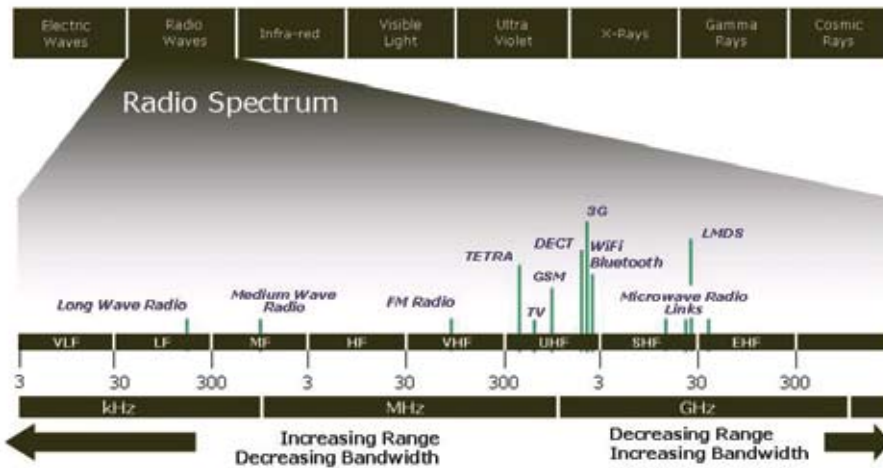
Other factors like rain fade due to heavy rainfall in the tropics renders the high frequency bands unreliable or unusable for communications. Such rainfall pattern is known to greatly attenuate high frequency signals, to the extent that satellite television reception in the Ku Band (such as those used by ASTRO) is sometimes rendered impossible by very heavy rainfall over a particular area. Then there is its

hilly terrain and dense tropical forest with lots of foliage as well as large area of water or sea which also effect radio wave propagation characteristics.

Research on rain fade mitigation may improve communications reliability in the high frequency ranges such as those above 25GHz in a tropical region and thus make spectrum available for high capacity links in Malaysia. Heavy tropical rain increases the propagation loss and this decreases the reliability of communications. In order to compensate for the additional propagation loss the link budget should be maintained with power



Typical Spectrum Use, Malaysia



control. Results of studies on rainfall pattern and its impact of propagation attenuation resulting in degradation of the reliability of communications and the quality of service can be used to design systems to mitigate it. At the moment, the nature of propagation at these higher frequencies makes communication possible only on short distances for point-to-point and point-to-multipoint applications (e.g. last mile access and backhauling). The International Telecommunications Union (ITU) also investigates the communications possibilities above 25 GHz in case of tropical environment and such research in Malaysia can contribute and collaborate with other researches in the ITU.

In addition, there is a need to explore new technologies and to study how it will impact spectrum use, its compatibility or sharing possibilities and constraints. Hence, there is a need to study the usage of modern wireless technologies such as satellite communications, high-altitude platform station (HAPS), ultra wideband and

white space communications, and the use of software and cognitive radios and other alternative technologies.

Safety of users of mobile phones is another area of interest due to the concern by the public on the Radio Frequency Radiation (RFR) emitted from the cellular Base Transmitter Station (BTS) and their own mobile phones. Their concerns stem from the proliferation of BTS due to the demands for new wireless services and the frequent reports on its danger. Emission levels studies in our environment will put together a better perspective for the public to understand and be knowledgeable or aware on the issues. Regulatory rules can be improved as well as compliance can be increased by the telecommunication service providers to better plan the placement of the network of transmitters to minimize dangers, if any, for future deployment and development of the industry.

Besides engineering studies, the research may also venture into the social impact of the various commu-

nication technologies to the public, be it for urban communities or even communities at very remote rural locations in the country. The findings from research in this area may be used by various parties to address digital inclusion. Services can then be rolled out in collaboration with related government departments or agencies and stakeholders in order to make sure that the take up is effective and thus contribute to improve the living condition and productivity of the targeted groups.

The results or findings arising from the research or studies will be shared with interested parties and SKMM has launched a web collaboration portal to share and disseminate the knowledge as well as increase networking.

Spectrum Research Collaboration Programme

The research program started in September 2006, when SKMM established the Research Collaboration Steering Committee (RCSC), responsible for the strategic direction, policy aspects, determination of priorities, recommendations of collaboration projects to the SKMM and approval of the annual operational plans of the SRCP.

The initiative aims to develop human capacity, support and promote research in spectrum management, encourage partnerships among universities, research institutions and the telecommunications industry, and facilitate the development of Malaysia as an ICT center of excellence.

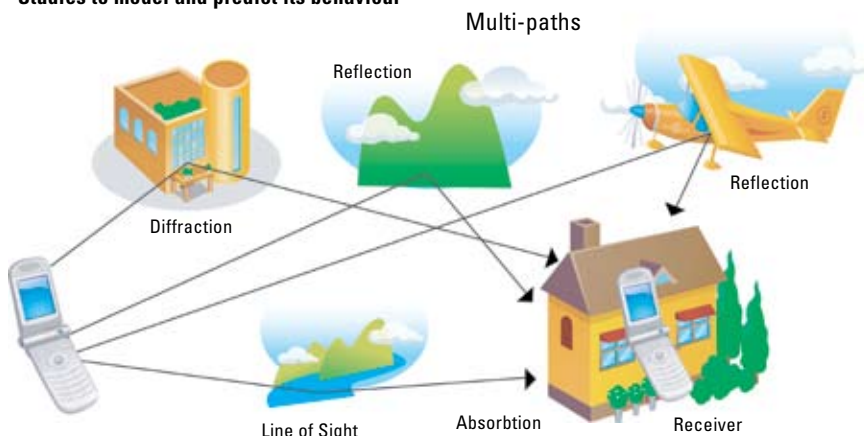
Only Malaysian IHLs in the public and private sector are eligible to participate in this SRCP. Other organizations that are interested to participate in the SRCP shall form collaborative partnerships with IHLs wherein the IHLs shall be the lead partner.

The SRCP has the following objectives in line with the overall goal of improving spectrum management:

- Serve as a focal point of knowledge development and Research and Development activity related to the spectrum management.

Radio Waves Propagation

Studies to model and predict its behaviour



- Develop SKMM knowledge resources.
- Provide platform for collaboration, sharing and exchange of knowledge, and to enhance capability and expertise to improve the management of spectrum.

SRCP Organizational Structure

The SRCP follows a project like structure, which ensures the necessary governance of the whole collaboration framework. The Research and Planning Division leads this project within the SKMM and plays an important role in terms of project management. There are three committees within the structure of the SRCP providing guidance in the collaborative process.

1. Research Collaboration Steering Committee (RCSC)

The SRCP is governed by the RCSC and chaired by the Chairman of the SKMM. Members of RCSC are selected from among members of SKMM, the Ministry of Energy, Water and Communication, representatives from the Communications and Multimedia industry, government agencies, various stakeholders and Deputy Vice-Chancellors of Universities (research).

The Steering Committee's role is to ensure the integrity, transparency and independence of the SRCP, the establishment and maintenance of world-class standards and reputation, appropriate networking of available resources, strategic direction and policy aspects, determination of priorities, recommend collaboration projects to the SKMM and the approval of the annual operational plan of the SRCP.

In addition, the Steering Committee may also modify the mandate of the SRCP where and when it deems necessary to improve the framework.

2. Research Collaboration Panel (RCP)

The Research Collaboration Panel supports the RCSC. Members of RCP consist of members from IHL

and the Industry which are elected by the RCSC. The RCP advises, manages and also monitors the research programmes. Its responsibilities include:

- Identification of the Collaboration programmes;
- Identification of the appropriate existing resources available within the programme perimeter (including subject matter experts);
- Development of programmes in collaboration with the IHL committed to the implementation of the selected programmes;
- Identification of research topics and evaluation of research proposals;
- Promotion of the Collaboration Programme to ensure its goals are achieve;
- Management and administration of the Collaboration Programme;
- Coordination to optimize the use of resources within the partnership; and
- Analyses and advises the Steering Committee and SKMM on research projects and their status.

3. Research Collaboration Secretariat

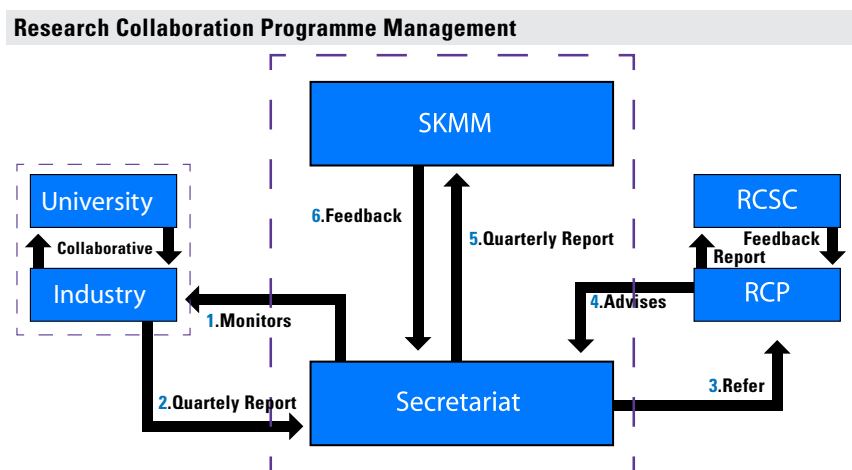
The Secretariat (also known as SRCP Secretariat) supports the RCSC

and RCP. The tasks of the Secretariat also include maintenance and updates of the website for the IHL Collaboration Programme (www.spectrumresearch.com.my).

Collaboration of the parties in the SRCP

The highest level of decision-making is assigned to the RCSC with final approval of research projects resting with the SKMM. The creation of the research projects and the management setup ensures the governance and the collaboration processes of the SRCP.

Collaboration among universities and industry in the research areas is facilitated by web networking between the various parties involved. Universities and industrial participants can form Research Collaboration Clusters which may collaborate not only with each other, but also with the Research Collaboration Panel. The SRCP establishes collaborative and exchange relationships with other centres and other entities locally, within the Southeast Asian region and overseas, which are engaged in similar or related initiatives. In this respect, it is of particular importance to make use of the collaboration possibilities within the Asia-Pacific Telecommunications framework. The figure below shows



1	Secretariat monitors the progress of research projects, by evaluating Quarterly Reports, conducting technical visits to University together with RCP and meeting with research team if necessary
2	Research teams are required to submit physical and financial progress report every quarter
3	Secretariat compiles quarterly reports and refers to RCP, as well as any outstanding matters pertaining the research
4	RCP advises Secretariat on technical issues regarding the research, while also reports the research progress to RCSC during Steering Committee meetings
5	Secretariat prepares paper and reports to SKMM management on the progress of the research projects, including advices and recommendations from RCP (if any)
6	SKMM management acknowledges the report and provide feedback to Secretariat on any outstanding matters, with proposed actions to be implemented or directions to be informed to specific research team (if any)

the functional relations between the parties in the Collaboration Program.

SKMM involvement in the SRCP

SKMM allocates an annual fund for selected research and development projects. The current allocation level is RM4 million per annum. Final approval for all research and development proposals rests with the SKMM. The amount of allocation may vary every year, depending on the approved budget by the management.

The Chairman of SKMM also sits as the Research Collaboration Steering Committee Chairman with current approved projects being monitored by the Research and Planning Division of SKMM. Lecture series, conferences and other events are also organized in support of the SRCP.

In addition, through this program SKMM also helps to connect the academic sector with the Communication and Multimedia industry. The academicians could use this platform to seek information on the current trend of telecommunication business where the industry players have the first hand knowledge about it, so that they could tailor their research and curriculum to meet the actual demand. Similarly, the industry could also seek the best researchers from the local universities, to help them to conduct research to meet their specific requirements. These collaborations is hoped to further develop and increase

the number of local experts in the field of spectrum.

Spectrum Research Priority Areas

Three priority research areas have been identified under the SRCP. They are:-

Emerging wireless technologies

The fast development of wireless broadband communications resulted in a greater demand for radio spectrum and the development of new technologies to cope with the increasing demand for broadband services. It is important for Malaysia to strengthen its R&D activities in these areas so to provide understanding on its impact to future use and management of spectrum. Some of these emerging technologies are Cognitive Radio, Software Defined Radio (SDR), high-altitude platforms (HAPS) and Ultra Wideband (UWB).

Spectrum management

In order to efficiently fulfil the increasing demand, spectrum management should put greater emphasis on the consideration of new emerging spectrum-efficient technologies but also of economic factors that have impact on spectrum usage behaviours. These studies will lead to development of policy and regulations to help manage increasing demands on the limited spectrum resource. Studies such as on spectrum cost against network cost and sharing and

on interference management and mitigation techniques.

Spectrum and us

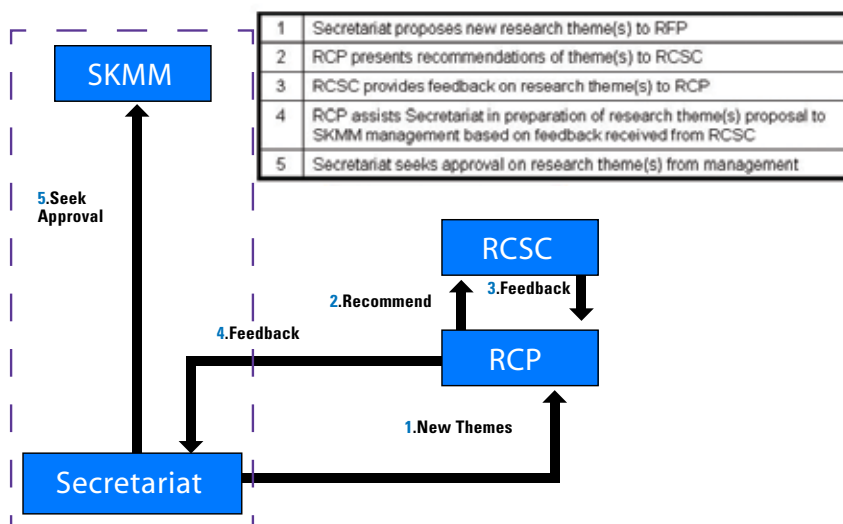
The increasing use of spectrum in our daily life has raised interest for many of us to understand its role in societal behaviours and health. There is a need to study how and to what extent this intensive use of the spectrum will change and affect our way of life. How the ever increasing and intensive spectrum use will influence and change our life is a very exciting theme for sociologists, political scientists and economists. Another area of study is the public concern on health issues arising from the proliferation of base station transmitters and frequent use of handphones. Study on levels of radio emission in selected urban areas could be measured and benchmarked against other cities and such results can be shared and models created to simulate its future impact by drawing upon and benchmarking against investigations carried out elsewhere as well as by the World Health Organisation.

Expected Outcomes

Beyond the empirical results of research and development projects, there are benefits arising from the collaboration programme. It will result in capacity building and knowledge growth for those who are dealing with spectrum management. There will be funding for research themes which are in line with the need of the industry. It will provide a platform for sharing knowledge and exchange of expertise locally, within the region and internationally.

Also, the field of spectrum management will be introduced to a wider audience through Spectrum Malaysia Events hosted by SKMM i.e. seminars, lectures, workshops and talks on laymen’s terms to help acquaint the corporates, academics and public on the various aspects of radio spectrum. The SRCP will indeed increase the weight of Malaysian spectrum management in the regional and international arena. Finally, the spectrum research objectives, directions and the expected outcomes are seen to be in line with promoting

Spectrum Research Collaboration Programme:- Development of research projects



and achieving the goals of the Ninth Malaysian Plan and the development strategies as in the Malaysian Information, Communications and Multimedia Services 886 (MyICMS886).

Selection of Research Projects

As mentioned earlier, SKMM will allocate a certain amount of research funds for the SRCP. The SRCP Secretariat will identify and announce the research themes or projects after careful analysis with inputs or advise from the RCP. The allocated fund may vary from year to year depending on the approved budget and the number of approved projects to be initiated in the year. The fund started with RM4 Million allocated for the research projects in 2007. The research themes are reviewed every year, depending on the research requirement.

Each lead partner IHL are encouraged to seek a secondary partner, which can be another IHL or one or more Malaysian or foreign company, organisation or government agency. This is to encourage greater scope of participation and promote academia/industry collaboration so that the research is more practical rather than academic and that networking or matching of brains with industry needs will improve the success rate, applicability and reduce cost.

The IHLs will submit their proposed research projects under their chosen theme, along with details like the time required and the cost to implement it. The SRCP Secretariat will evaluate their proposals together with a tender committee comprising professionals within SKMM, and also supported by the RCP's member who would assist in conducting the technical evaluation of the submitted proposals.

The RCP will help the SKMM evaluate each proposal to assess its necessity, its importance, cost effectiveness and whether the proposed research has already been conducted elsewhere. Once decided the funds will be allocated to the IHL recipients.

Research Projects 2007

The Request for Proposal (RFP) was first issued in 2007 and 22 offers were submitted and following the evaluation process, 9 subjects were chosen in 5 themes as the most important ones for the future research collaboration with different universities.

Seven universities received research grants to conduct 11 research projects in 2007. The following table shows the research subjects and universities where the research is currently being carried out.

It may be noted that partnership between IHLs is best suited when the researchers compliment each other with no conflict or overlapping interest

in its results, such as in Uniten's collaboration with UTM on the effects of radio frequency radiation.

On the other hand, research on live cases or actual implementation is best conducted in partnership with an industry player operating in the field, such as that conducted on spectrum needs of emerging wireless technology by UTM, UKM and Maxis, and on synergizing 2G, 3G and WiMAX by UM and DiGi.

Monitoring of Research Projects

The progress of the current research projects are being monitored closely by the Secretariat, with assistance from the RCP.

The research teams are required to submit reports every quarter on the physical and financial progress of the research projects. These reports will be analyzed by the Secretariat and then presented to the RCP and SKMM. The reports are due on 7 January, 7 April, 7 July and 7 October every year.

In addition, technical visits are also conducted by the RCP and Secretariat to the university, in order to assess the research project's progress, meet or network with the research team, as well as auditing the expenditure related to the project.

Where necessary, technical assistance and advises are also provided to the research team, to ensure that the

Research Projects: 2007

No.	Research Subjects	Universities	Collaborative Partners
1	Impact on the society	UTM, UKM	University of Sydney, IIUM, UniKL, UUM
2	Radiation hazard	Uniten	UTM
3	Spectrum cost vs network cost	UNiM	First Principle Sdn Bhd
4	Cognitive radio	UTM	Uniten, IIUM
5	Frequency adaptive HF systems	UTM	UMP, MRCS, RF Communication Sdn Bhd
6	Frequency use above 25 GHz	UPM	UTM, USM, IIUM, CRC (Canada)
		MMU	MUST
7	Spectrum needs for IMT-Advance	UTM	UKM, Maxis
8	Coexistence in extended C-band	MMU	MIMOS
9	Synergizing 2G, 3G and WiMax	UM	DiGi

Lectures in 2007

No.	Title	Presenter	Date
1	Current Activities Within ITU-R Towards IMT-Advance or 4G Systems	NTT DoCoMo	4 Oct 2007
2	Mobile TV	Qualcomm	4 Sept 2007
3	Approches in Refarming of Spectrum and Spectrum Management	Telenor	16 Aug 2007
4	Evolution to Next Generation Mobile Network	Maxis Communications	17 Aug 2007
5	Wirweless Broadband Access. An Overview on Standards and System Trail in Malaysia	MMU & DiGi	12 July 2007
6	Smart Antenna and Location Based Services	UTM	21 Mar 2007
7	Spectrum Rules OK: Wireless Communications from Submarines to Satellites	UTHM	1 Dec 2006

research objective is met in accordance to the research agreement signed between the IHLs and SKMM in the collaboration project.

Spectrum Research Web Portal

The SRCP web collaboration portal (www.spectrumresearch.com.my) was completed and operational by the end of 2007. The collaboration portal has since been utilized by the research teams for conducting online discussion and communications on the research topics, exchanging and developing new ideas for new research subjects and also announcement for upcoming Spectrum Malaysia Events.

Membership to the portal is open to the public by registration. However only selected registrations will be approved as member, depending on the background of the applicant.

The RCP uses the portal for all communications within themselves including discussion on outstanding matters and dissemination of meeting minutes, are done in the portal. However, the forum of RCP is only accessible to the RCP members and Secretariat only.

In addition, the Research Framework which was issued on 20 April 2007 is also available at the Download section of the portal. The web portal was officially launched during the RCSC

Lecture Series

Other activities conducted in support of the Collaboration Programme include a series of seven lectures conducted throughout the year, with invited speakers coming from the industry and universities and with attendance by members from the industry, government and the universities.

The table above lists the Lecture Series that have been conducted in 2007:

Topics scheduled in 2008 are Set Top Box and Digital TV (completed in February), WiMAX – Interoperability for Large Scale Commercial Deployment (June), Cognitive Radio Networks (July), Free space optical links (August), Unmanned aircraft systems (September), ITU and Radio-communication sector (October) and Short range devices for wireless digital homes (November).

Research Projects 2008

Meanwhile, the SRCP Secretariat will announce the themes for the next round of research collaboration this July and it aims to award new research grants in October.

Further details and updates on the Collaboration Programme are available at www.spectrumresearch.com.my while soft copies of the current and back issues of this magazine are available at <http://myconvergence.com.my>.

Acronyms

Research	Subjects Universities
CRC	Canadian Research Center
DiGi	DiGi Telecommunications Sdn Bhd (mobile operator)
IIUM	International Islamic University Malaysia
Maxis	Maxis Communications Berhad (mobile operator)
MIMOS	Malaysian Institute of Microelectronic Systems
MMU	Multimedia University
MRCS	Malaysian Red Crescent Society
MUST	Malaysian University of Science and Technology
UKM	Universiti Kebangsaan Malaysia
UM	Universiti Malaya
UMP	Universiti Malaysia Pahang
UNiM	University of Nottingham Malaysia
Uniten	Universiti Tenaga Nasional
UniKL	Universiti Kuala Lumpur
UPM	Universiti Putra Malaysia
USM	Universiti Sains Malaysia
UTHM	Universiti Tun Hussein Onn Malaysia
UTM	Universiti Teknologi Malaysia

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