

# 5G & SATELLITE CARIBBEAN 2018 ON SPECTRUM, STANDARDS AND SCALE

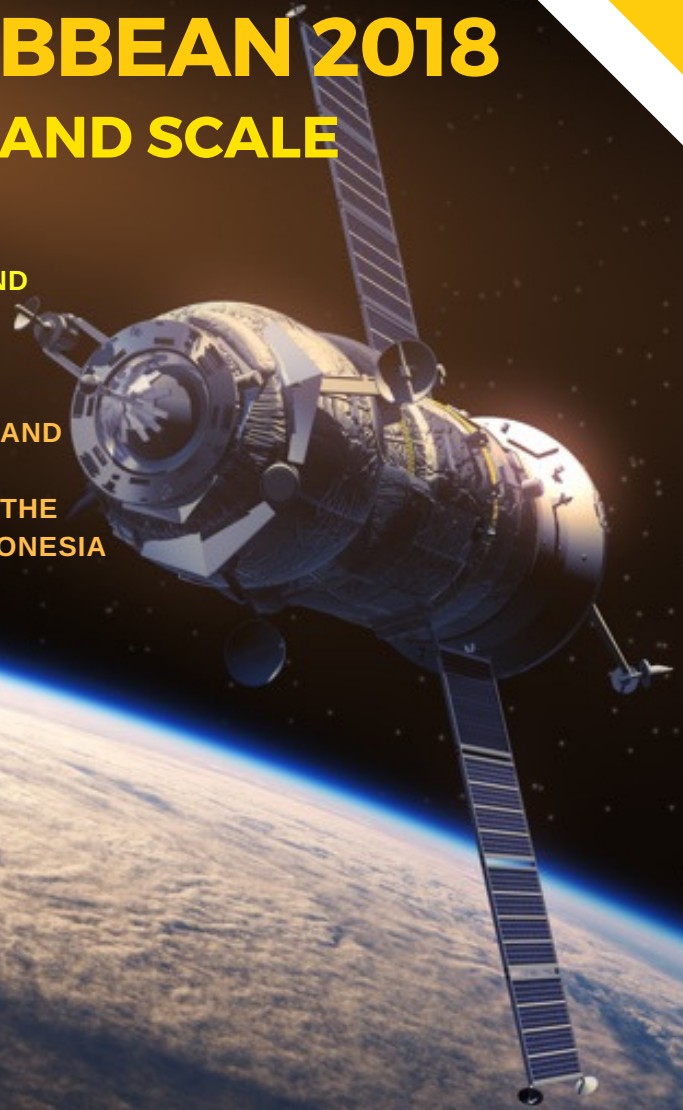
## A TECHNO ECONOMICS WORKSHOP

**3 DAY: 23 - 25 APRIL, 2018**  
**MON - WED**  
**PORT OF SPAIN,**  
**TRINIDAD AND TOBAGO**

"GOOD TOPICS AND  
PRESENTATION"  
PARTICIPANT  
MINISTRY OF  
COMMUNICATION AND  
INFORMATION  
TECHNOLOGY OF THE  
REPUBLIC OF INDONESIA  
(MCIT)

Early Bird till Jan 19, 2018

**Registration**  
**ON NOW**



## Your Vision. Our Expertise.

Successful Launch in Australia and Singapore in 4Q 2017 with Government Participation from Australia, Singapore and Indonesia and Industry Stakeholders.

The workshop combines practical detail with strategic insight gained from over 30 years of involvement in the mobile broadband and satellite sector and consists of four sessions by UK and Global Expert, Geoff Varrall of RTT UK.



Geoff Varrall  
RTT UK

**A Niche  
Markets Asia  
& RTT UK  
Collaboration**

To register,  
please email  
daniel@nichem  
arketsasia.com,  
thank you!

Past Attendees include the Singapore Police Force, McKinsey & Co., the Australian Communications and Media Authority (ACMA), Department of Defence, Australia, the Ministry of Communication and Information Technology of the Republic of Indonesia (MCIT), ABS Global Limited, Kacific Broadband Satellites, Inmarsat Australia, SES, Digicel PNG, the Info-communications Media Development Authority of Singapore (IMDA), OrionSpace, and more.

"GOOD OVERVIEW OF 5G  
AND SATELLITE TRENDS"  
PARTICIPANT  
INFO-COMMUNICATIONS  
MEDIA DEVELOPMENT  
AUTHORITY OF  
SINGAPORE (IMDA)

**HOW CAN SATELLITES PLAY A ROLE TO INTEGRATE  
WITH 5G NETWORKS (FOR NETWORK BACKHAULING)?**

**SHOULD 28 GHZ BAND BE SHARED AMONGST  
ALL THREE ENTITIES (GSO, NEWLEO AND 5G)?**

# 5G AND SATELLITE CARIBBEAN 2018

## ON SPECTRUM, STANDARDS AND SCALE

### Why You Should Attend

"TECHNO ECONOMICS AND PERFORMANCE COMPARISON OF MOBILE AND SATELLITE INDUSTRY"

"QUALIFY AND VALIDATE PRESENT AND FUTURE SPECTRAL AND TECHNOLOGY INVESTMENT DECISIONS"

- Satellite operators will benefit from a more detailed understanding of the standards work and supply chain dynamics of the 5G industry
- Terrestrial mobile broadband operators developing 5G roll out plans and 5G business plans will benefit from a more detailed understanding of the changing technology economics of the satellite industry
- And Regulators need a balanced view of the technology and economic positioning of 5G and satellites and the potential benefits of spectral and standards collaboration

### The workshop covers

- the economics and technologies for Satellites to be factored into 5G Business Modelling
- the effects of future standards and spectrum on police and military and how changes in the commercial sectors will affect them,
- the practical impact of band plan and channel plan and guard band options on physical layer implementation including sub carrier options (15, 30, 60, 120, 240, 480 KHz) and modulation options
- the 5G standards process with present and likely future Satellite standards
- the link between Satellite enabling technologies (angular power management and fractional beam width antennas)
- standards based intellectual property added value and cost
- 5G and Satellite Supply Chain and Stakeholder Interests
- 5G and Satellite Regulatory and Competition Policy
- a case study on sub 1 GHz 5G (Sub G 5G) and 3GPP/IMT2020 Low Mobility Large Cell work items
- a case study of how candidate 5G waveforms (FBMC, UPMC, GFDM and f-OFDM) will coexist with Satellite A-PSK
- Transition from national networks to global networks - Global scale, a pre-requisite to meet required delivery cost and sustainable ROI
- a case study on the economics of national broadband networks versus global broadband networks using Australia as a benchmark

To register, please email [daniel@nichemarketsasia.com](mailto:daniel@nichemarketsasia.com), thank you!



# 5G AND SATELLITE CARIBBEAN 2018

## ON SPECTRUM, STANDARDS AND SCALE

### Indepth Technical and Economics Insights



"Technology innovation is reducing capex and opex in the satellite industry but increasing capex and opex in the mobile broadband industry.

We analyse the impact this will have on 5G and satellite operators and vendors and other stakeholders including Google, Apple, Facebook and Amazon (the GAFA quartet)."

"The workshop will provide an objective analysis of the relative economics of 5G versus Satellite based K band mobile and fixed broadband connectivity.

We analyse the opex multipliers implicit in 5G terrestrial network densification and compare these with the rapidly changing economics of LEO, MEO and GSO space based delivery.



Within the past ten years the throughput of 'The Big Sats' has moved from 320 gbps to 1000 gbps per satellite.

Co-location and on orbit servicing and hardware upgrades promise a further step function leap in GSO capacity matched by even larger improvements in LEO and MEO platform capability.

New launch options and production methods are transferring the economics of delivering satellites into space.

Electric satellites and new solar cell technologies are together increasing the RF power available from space and orbit life expectation.

Flat panel adaptive and passive antennas combined with the 'nearly always nearly overhead' link connectivity available from high count mixed LEO, MEO and GSO constellations can and will produce significantly stronger flux densities than terrestrial based systems working in K band spectrum".



"The successful launch from New Zealand of the first Rocket lab space vehicle at the end of May 2017 marks another step in developing low cost access to space.

The launch is further validation that space economics are changing faster than most terrestrial operators realize suggesting that satellites can and should be factored into 5G business modelling."

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# 5G AND SATELLITE CARIBBEAN 2018 ON SPECTRUM, STANDARDS AND SCALE

## Geoff Varrall



### About Your Techno Economics Presenter

Geoff Varrall joined RTT in 1985 as an executive director and shareholder to develop RTT's international business as a provider of technology and business services to the wireless industry.

He co-developed RTT's original series of design and facilitation workshops including 'RF Technology', 'Data over Radio', 'Introduction to Mobile Radio', and 'Private Mobile Radio Systems and developed 'The Oxford programme', a five day strategic technology and market programme presented annually between 1991 and 2005. Geoff has been running in depth technology and market workshops for the industry for over 33 years, spanning five generations of mobile cellular technology.

A co-author of the Mobile Radio Servicing Handbook (Heinemann Butterworth, UK), Data Over Radio, (Quantum Publishing, Mendocino, USA and 3G Handset and Network Design (John Wiley, New York). Geoff's fourth book, Making Telecoms Work – from technical innovation to commercial success (John Wiley) was published in early 2012. His most recent book, 5G Spectrum and Standards was published by Artech House in July 2016.

He also writes regularly for a number of European trade journals and chairs a broad cross section of industry conference and trade events, and is a co-author of the Policy Tracker study - 5G and its vertical markets - challenges and opportunities 2015-2030.

Geoff graduated from St Johns College Cambridge in 1975, has played Jazz trumpet for just over 50 years and is a keen and moderately competitive marathon runner.

RTT is an affiliate SME Partner to 5G Innovation Centre (5GIC).

# 5G AND SATELLITE CARIBBEAN 2018 ON SPECTRUM, STANDARDS AND SCALE

## 3 Day Agenda

### Day 1 Morning

#### Session 1: 5G and Satellite Spectrum

There is considerable debate as to where 5G can be profitably deployed in terms of spectrum allocation with options that include UHF, L band, S band, C band, Ku-band, Ka-band and E band.

In this first session we review all present pass band options and possible channel plans and explore the technical trade-offs between multiplexing gain, RF efficiency and DSP bandwidth.

5G and Satellite coexistence and spectral access and ownership issues are discussed together with guard band and filter implications and their related impact on device performance and device and network economics.

We include

- a case study on sub 1 GHz 5G (Sub G 5G) and 3GPP/IMT2020 Low Mobility Large Cell work items
- and consider the potential benefits of scaling 5G to larger radius cells coupled to the use of Satellites for 5G backhaul and as 5G repeaters and relays for urban and rural large and small cell coverage.

To register, please email  
[daniel@nichemarketsasia.com](mailto:daniel@nichemarketsasia.com), thank you!

### Day 1 Afternoon

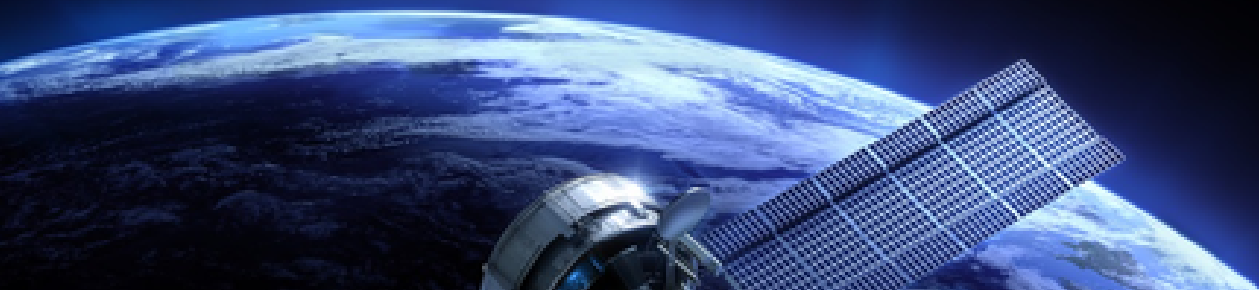
#### Session 2: 5G and Satellite Standards and Scale

We summarize the present 3GPP Release 15 and Release 16 standards process and related IEEE and 5GTF standards initiatives including

- the proposed convergence of fixed access and mobile standards
- and review the practical impact of band plan and channel plan and guard band options on physical layer implementation including sub carrier options (15, 30, 60, 120, 240, 480 KHz) and modulation options
- with a case study of how candidate 5G waveforms (FBMC, UFMC, GFDM and f-OFDM) will coexist with Satellite A-PSK.

We compare the 5G standards process with present and likely future Satellite standards and the link between Satellite enabling technologies (angular power management and fractional beam width antennas) and standards based intellectual property added value and cost and highlight the need for global scale as a pre-requisite for sustainable ROI.

The cost economics of sub 1 GHz 5G are explored (450 MHz, 600, 700, 800, 900 MHz 5G refarming) in the context of specific vertical market requirements together with a cost economic assessment of Satellite and terrestrial service integration.



# 5G AND SATELLITE CARIBBEAN 2018 ON SPECTRUM, STANDARDS AND SCALE

## 3 Day Agenda

### Day 2 Morning

#### Session 3: 5G and Satellite Supply Chain and Stakeholder Interests

We compare and contrast the 5G and Satellite industry supply chains and other related supply chains including the automotive industry, web scale companies, defence and near and deep space industry.

Our sector analysis includes enterprise value and related debt ratios, cash position and future competitive positioning.

### Day 2 Afternoon

#### Session 4: 5G and Satellite Regulatory and Competition Policy

The impact of the evolving supply chain on 5G and Satellite regulatory and competition policy is analysed and discussed in the context of future spectral asset value including related issues of auction policy and the arguments for and against low cost and no cost spectrum and primary and secondary access rights.

Day 3 ends at 14:00

Special Case Studies,  
Pre-Course Questionnaires Topics  
Q & A and Open Discussions

To register, please email  
[daniel@nichemarketsasia.com](mailto:daniel@nichemarketsasia.com), thank you!

#### Who Should Attend:

- engineering, marketing and financial team leaders planning or implementing 5G networks,
- next generation LEO, MEO and GSO satellite networks in the Caribbean region and the wider Americas,
- Regional Solutions Providers and Project Leaders developing associated products and services,
- vertical market stakeholders including the automotive industry, utilities, public safety agencies and defence industry, web scale internet companies and regulatory agencies.

#### IN-HOUSE TRAINING

- Unlimited Participants - Save up to 35%

This workshop can be tailored solely to your organization's needs anywhere, any time.

Some of our distinguished clients include ABS Global Limited, Kacific Broadband Satellites, Inmarsat Australia, SES, Digicel PNG, OrionSpace, the Info-communications Media Development Authority of Singapore (IMDA) and more.

To discuss how we can work together to achieve your learning requirements, please contact:

**Daniel Tan, Project Specialist**

Mobile: +65 9450 2005 (24 hours)

Email: [daniel@nichemarketsasia.com](mailto:daniel@nichemarketsasia.com)

