

6 GHz: Wi-Fi and IMT Coexistence

World Wi-Fi Day Celebrations
*Unlocking the Full Potential of 6GHz Wi-Fi in India:
Policy, Power & Possibilities*

Date: 24-06-2026

Dr. Vivek Ashok Bohara

Member: TSDSI

Wirocomm & Optical Wireless Research Group

Professor and Dean (IRD),

Chair: IEEE Communication Society, Delhi Chapter

Ex: TiH-IoT Chanakya Faculty Fellow (TiH Foundation IIT Bombay)

IIIT-Delhi

Lab: <https://www.iiitd.edu.in/~wirocomm/>

AGENDA: Workshop on 6 GHz Spectrum Coexistence



Motivation

Project background, scope, and objectives.



Spectrum Environment

Understanding the upper 6 GHz band landscape.



Coexistence Challenges

Analyzing OOB and interference vectors.



Technical Guidelines

Emission masks, guard bands, and filter requirements.



AI-Native Sharing

Standardized AI-driven interference mitigation.



Recommendations

Key takeaways and future steps.

About Us

Wirocomm was established December 2014, IIIT Delhi. With an Initiative to promote World Class Wireless and Optical Communication Research. In Wirocomm, we work on the latest 6G, 5G, 4.5G LTE-pro and LTE-A standards.

The research in the group main focuses on:

- Visible Light Communication (VLC)
- Vehicular Visible light communication (V2LC)
- Integrated Fiber-Wireless (FiWi) networks
- Hybrid LiFi-WiFi networks (HLWNets)
- Underwater Communication
- UAV assisted Communications
- Solar Communication
- Digital Twin and Metaverse

Sponsored/Hardware Projects:

- ❑ Design of Non-Orthogonal Multiple Access (NOMA) Systems for Future Vehicular Communication: Funded by SPARC, MoU, Gol.
- ❑ Optical Wireless Access Network for Rural and Urban Communication: Funded by MeitY, Gol.
- ❑ Machine Learning for Efficient Millimeter-Wave Communication: Funded by DST SERB, Gol.
- ❑ Designing a cost efficient and optimized Green Broadband Access Network for Rural India Using Fiber Wireless (FiWi) Access Network Architecture appropriate for NoFN: Funded by MeitY, Gol.
- ❑ Other funding from various sources like Cognizant, TCS, UGC, Intel etc.

Research Highlights

- A team of **30+** research scholars including **12** Ph.D., **4** M.Tech, and numerous B.Tech. and intern students.
- Ongoing sponsored Projects worth more than **5 crores**
- **12+** Indian and US patents
- **100+** papers published in Transaction & Journals including IEEE TVT, IEEE TCOM, IEEE T-ITS, IEEE TNSE, IEEE TNSM, IEEE TGCN, etc.
- More than **200** conference papers including flagship conferences like IEEE International Conference on Communications (ICC), IEEE Global Communications Conference (GLOBECOM), IEEE WCNC, IEEE ANTS etc.
- Student fellowships from Visvesvaraya, Cognizant, TCS, UGC, MeitY etc.
- Graduated Ph.D. students working with Qualcomm, Wipro, BITS Pilani-Goa Campus, National Instruments, etc.
- Tie-ups with universities like: The University of Essex (UK), Georgia State University (Georgia), The University of Oulu (Finland), The Nanyang Technological University (Singapore), The University of Edinburgh (UK), IIT-Delhi, VNIT, Nagpur etc





CoE vision includes developing solutions and products and enhances the last mile, connectivity connectivity using Visible Light Communication (VLC), as well as to standardization bodies, manpower meat faculty as well as, development of parrier of training and couursos as well as students and engineers), and developres on VLC, and beyond, through TSDSI and lead the foat way for international standardization of the context of 5G VLC based solutions through 3GPP.



Activities

- Workshops, Training Programs, Invited from EEU experts
- Development of course Bevenlopement and MOOC
- Vehicular Vight-Wireless (FIWI) Communication (HLWN) networks, Product Hachathon, etc.



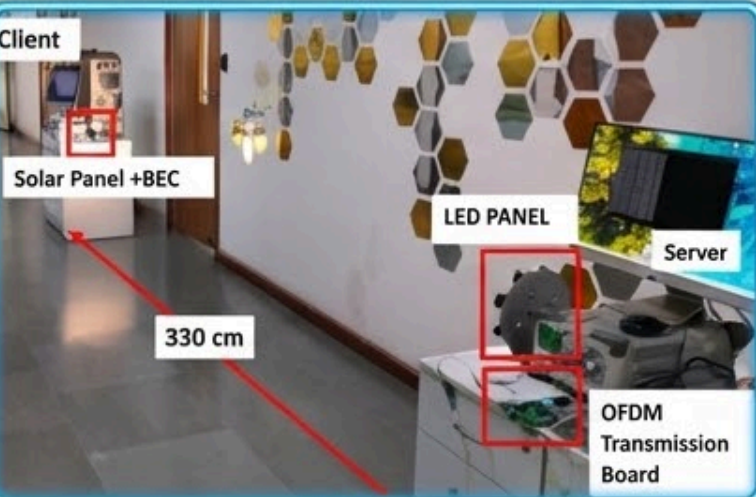
Events & Talks

- Workshop on "Next Generation Networks"
- Five-day-oline course on "Wext Emerging Wieleess Communication comunes: 36 and Beyond"
- Alecture for FDP "Application of AI Wireless Communication and Senar:Gcemuniiaion: KTDOD"

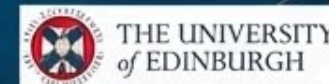
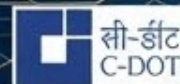


Upcoming Project

- Development of Massive Online Conse: Title:: Optical Wireless and Potential Atitionation onrit vision and Beyond



Collaborations



Courses >

Fundamentals Of Wireless Communication (Hindi)

By Prof. Vivek Ashok Bohara | IIIT-Delhi

Learners enrolled: 1643 | Exam registration: 60



Summary

Course Status :	Completed
Course Type :	Elective
Duration :	8 weeks
Category :	Electrical, Electronics and Communications Engineering
Credit Points :	2

Advanced topics in Wireless Communication (Hindi)

By Prof. Vivek Ashok Bohara | IIIT-Delhi

Learners enrolled: 4126 | Exam registration: 177



Summary

Course Status :	Completed
Course Type :	Elective
Duration :	8 weeks
Category :	Electrical, Electronics and Communications Engineering
Credit Points :	2
Level :	Undergraduate/Postgraduate
Start Date :	19 Feb 2024
End Date :	12 Apr 2024

[Home](#) > [Courses](#) >

Enabling Technologies for 6G Communications Networks (Hindi)

By Prof. Vivek Ashok Bohara | IIT-Delhi

[Join](#)

Learners enrolled: 213



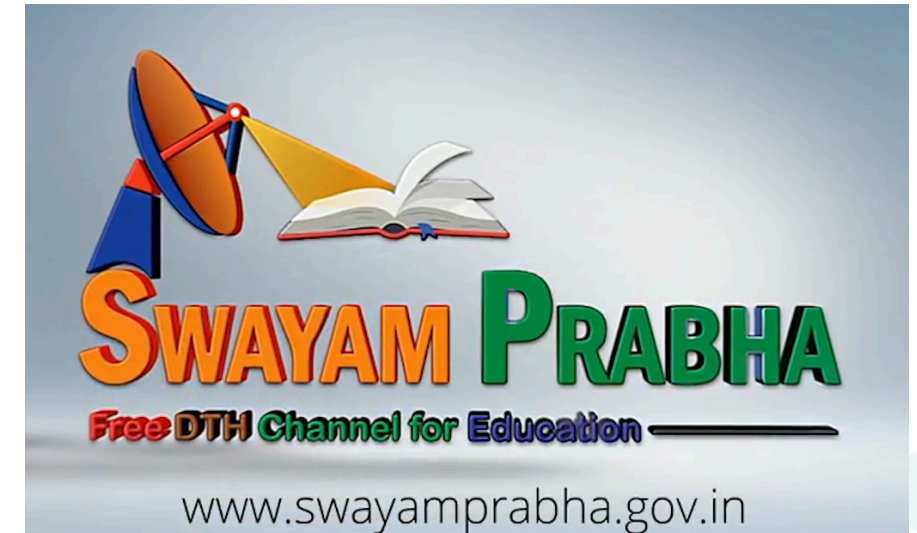
Summary

Course Status :	Upcoming
Course Type :	Elective
Language for course content :	English
Duration :	4 weeks
Category :	- Electrical, Electronics and Communications Engineering - Communication and Signal Processing

Swayam Prabha (DTH Course)



Wireless and Cellular Communication Systems (Hindi) by Dr. Vivek (**Channel No. 18, IIT Bombay: Electronics and Communication Engineering**).



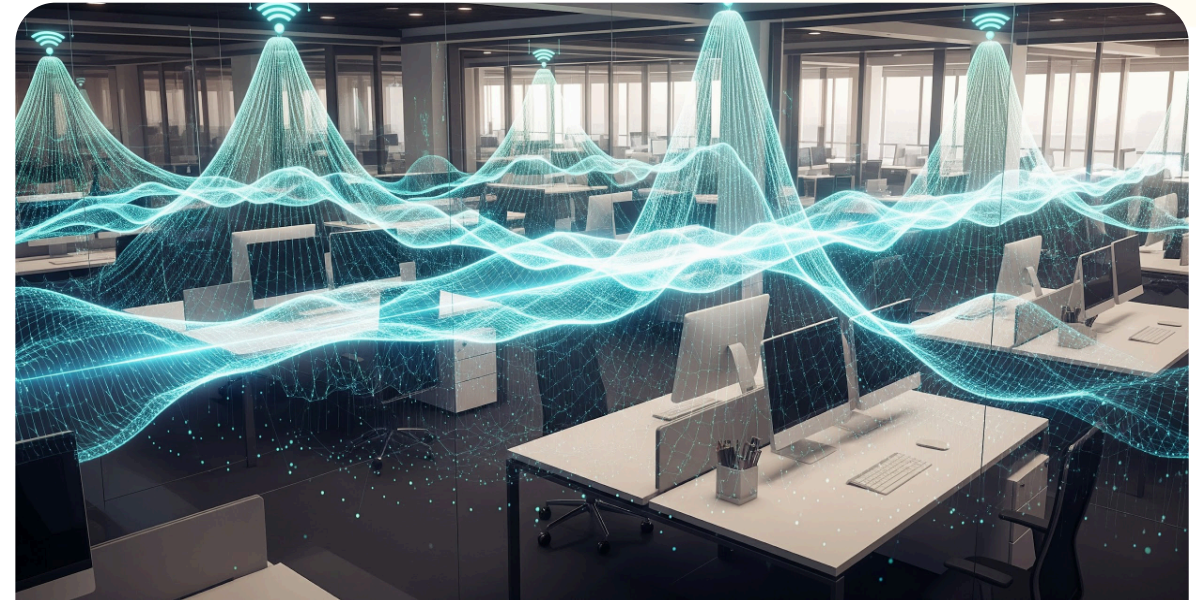
New NPTEL Course: Fundamentals of Li-Fi and Wi-Fi



Li-Fi (Optical Wireless)

Explore High-Fidelity communication using the visible light spectrum.

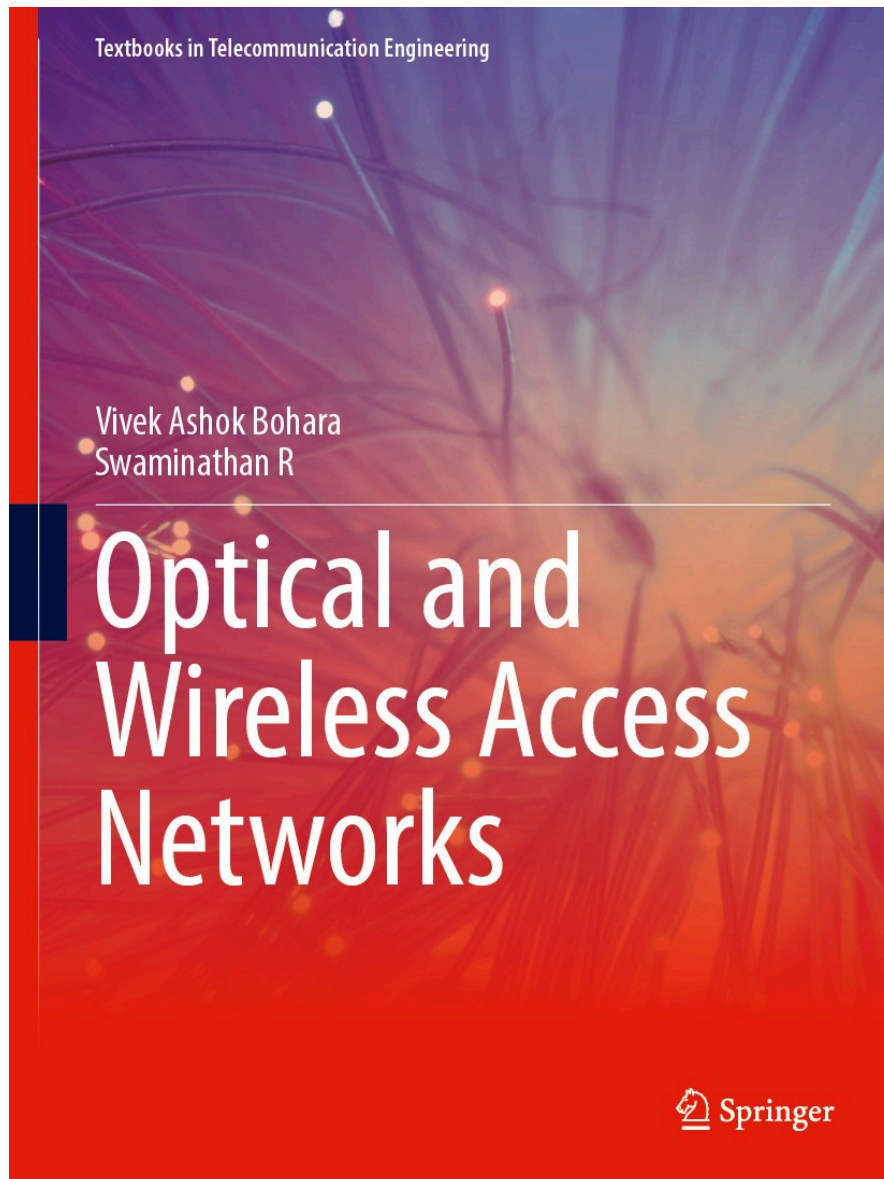
- Up to 100 Gbps speeds
- Confined to physical spaces (High Security)
- Immune to RF interference



Wi-Fi (IEEE 802.11)

Study the evolution of radio-frequency standards from WiFi 6 to WiFi 7.

- Broad, multi-room coverage
- Versatile & mobile connectivity
- Operates in 2.4, 5, and 6 GHz bands



[Optical and Wireless Access Networks | SpringerLink](#)

The Future of Connectivity Starts Here

Fiber in the ground. Spectrum in the air. Intelligence at the edge.

This book bridges the two worlds that power modern communication — **optical access networks and wireless access systems** — in one cohesive, research-driven framework.

If you teach telecom.

If you research 5G/6G.

If you build networks.

This is not optional reading. This is foundational.

Why This Book Matters

The access network is where user experience lives or dies. And most textbooks treat optical and wireless separately.

This one doesn't.

It delivers:

- ✓ Unified treatment of fiber and radio access
- ✓ Mathematical rigor + practical architecture
- ✓ GPON, XG-PON, 5G NR, FWA, LiFi, FSO
- ✓ Integrated optical– wireless convergence models
- ✓ Design challenges for next-generation 6G systems
- ✓ Problem sets and academic resources

It's built for classrooms — but written with research depth.

Ideal For

B.Tech / M.Tech telecom students

PhD scholars in wireless & optical systems

Faculty designing new-age access network courses

Industry professionals working on 5G/6G deploy



THE STRATEGIC IMPORTANCE OF THE UPPER 6 GHz BAND FOR 6G

Key Message

The 6425–7125 MHz band represents one of the last globally available mid-band spectrum opportunities capable of delivering the capacity, coverage, and cost efficiency required for future IMT-2030 (6G) networks. At the same time, ensuring coexistence with adjacent services is essential for maximizing spectrum utilization while protecting incumbent operations.

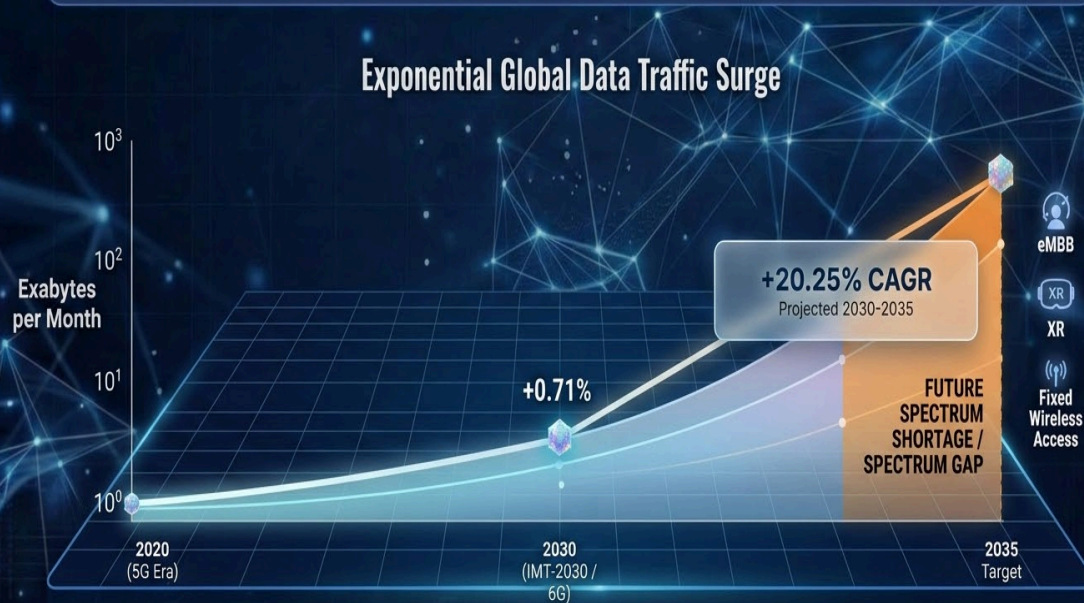


MOBILE TRAFFIC & SPECTRUM OUTLOOK (2020-2035)

ITU APT

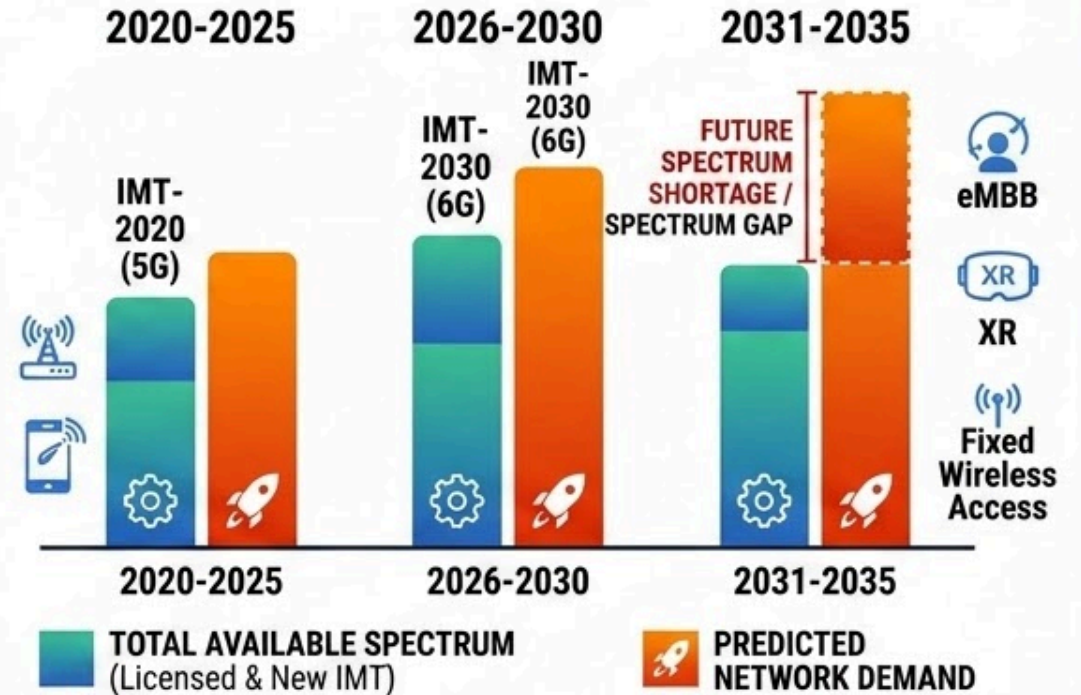
ITU APT

Mobile Traffic Growth Outlook (2020-2035)



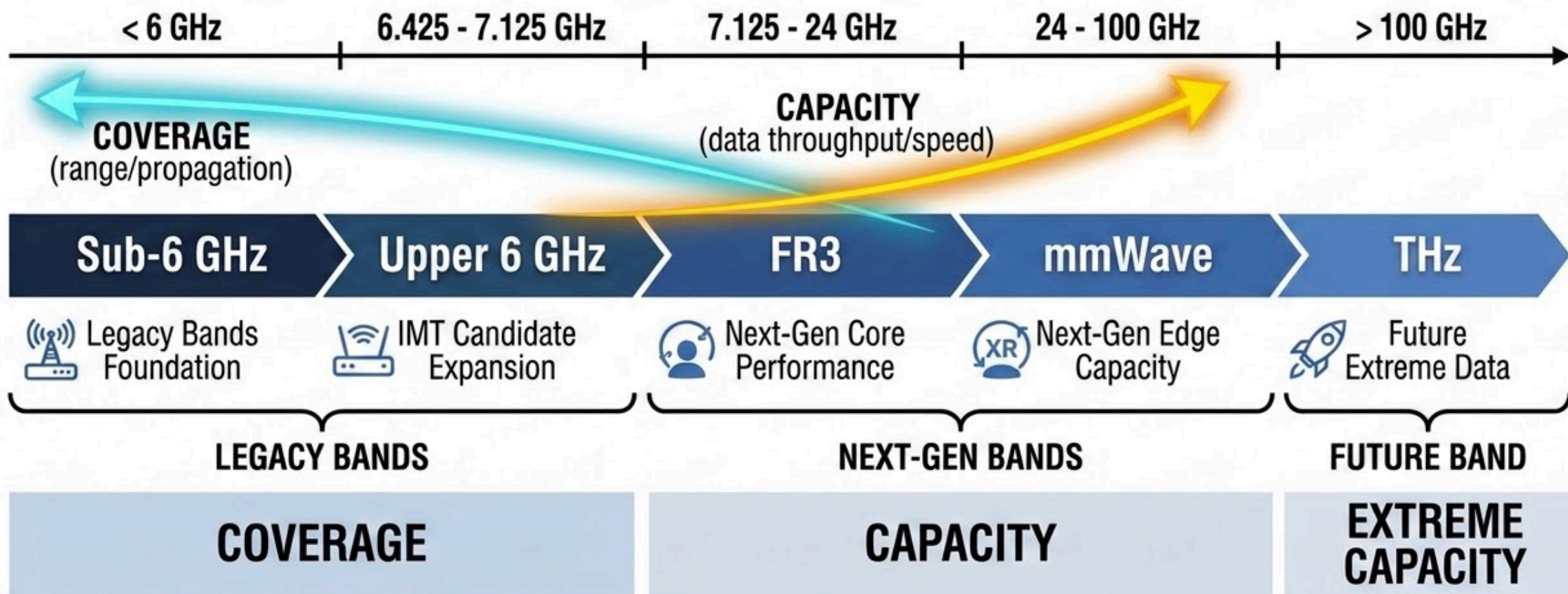
TECHNICAL INTEROPERABILITY: MULTI-LAYER COEXISTENCE PARAMETERS

SPECTRUM DEMAND VERSUS AVAILABILITY



TECHNICAL INTEROPERABILITY: MULTI-LAYER COEXISTENCE PARAMETERS

SPECTRUM UTILIZATION ACROSS BANDS



WHY THE 6425–7125 MHz BAND MATTERS



VAST SPECTRUM

700 MHz contiguous spectrum for massive data throughput



IMT-2030 / 6G

Primary candidate band for the next generation of mobile communications



NEXT-GEN USE CASES

Crucial support for eMBB, Extended Reality (XR), and Fixed Wireless Access



ADJACENT SERVICES

Strategic requirement to protect and coexist with existing adjacent services

ANALYSIS: UPPER 6 GHz SPECTRUM EVOLUTION

Why the 6425–7125 MHz Band Matters



Vast Spectrum

700 MHz of contiguous spectrum available for massive data throughput.



IMT-2030 / 6G

Primary candidate band for the next generation of mobile communications.



Next-Gen Use Cases

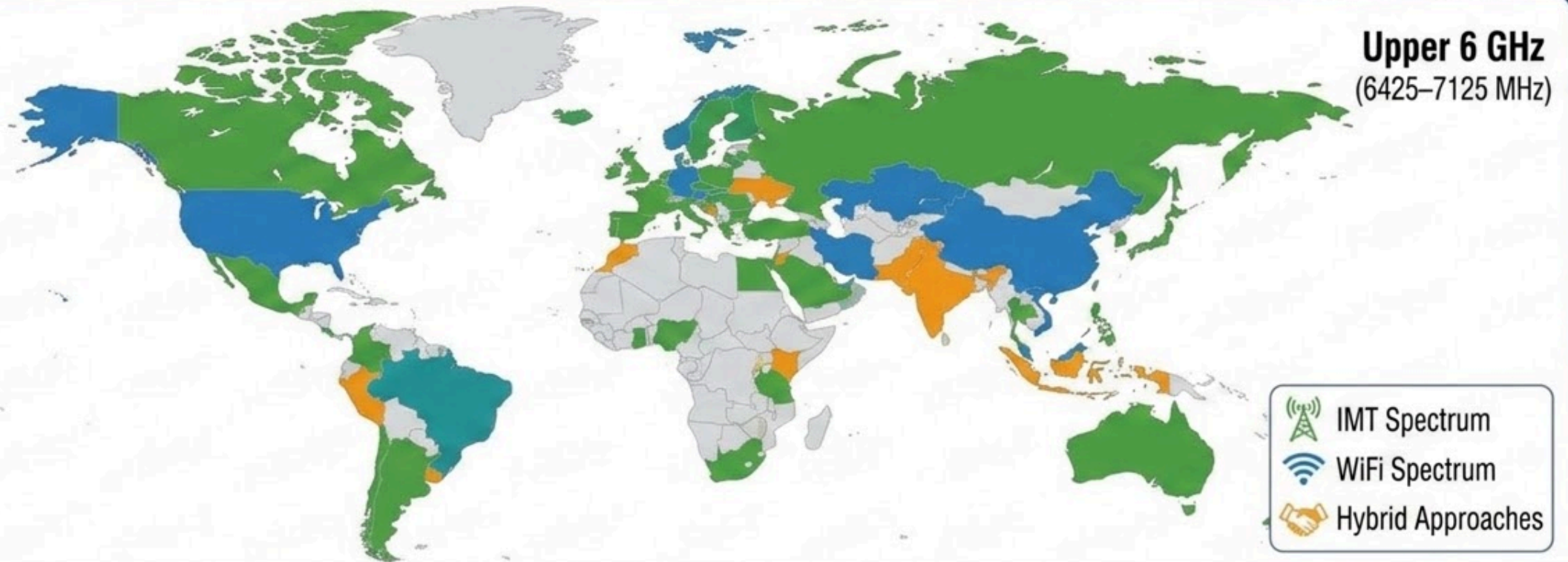
Crucial support for eMBB, Extended Reality (XR), and Fixed Wireless Access.



Adjacent Services

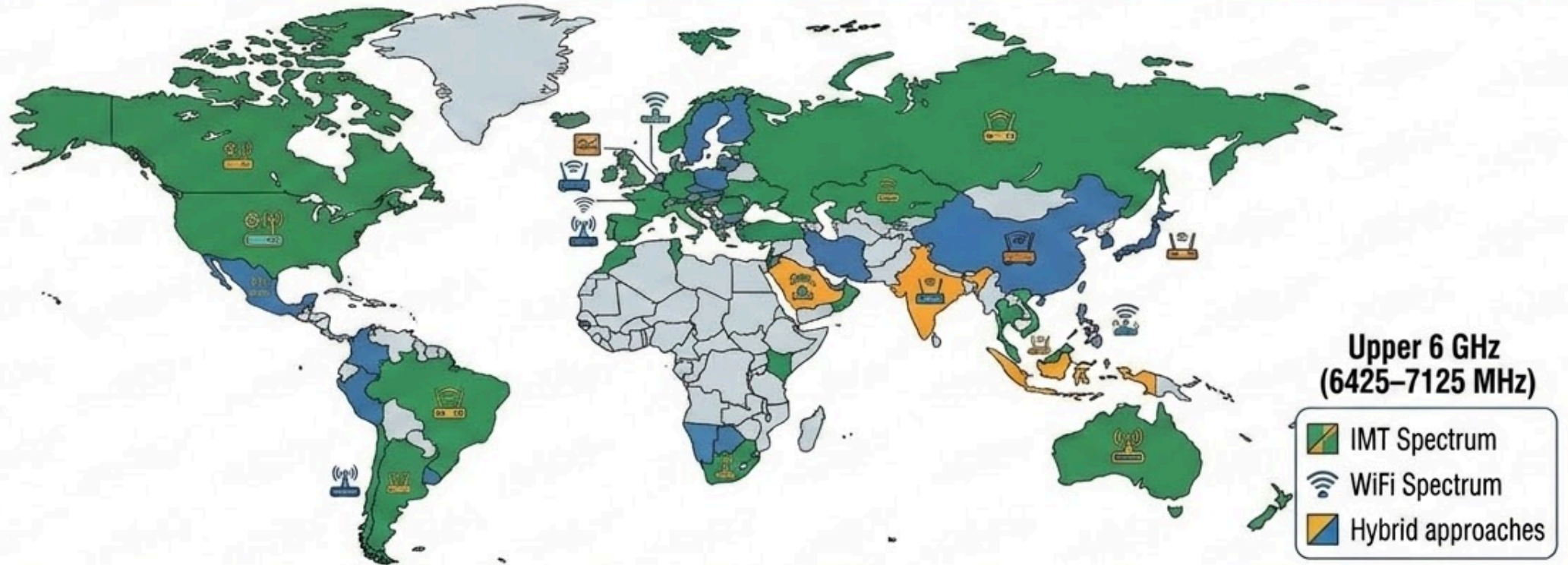
Strategic requirement to protect and coexist with existing adjacent services.

GLOBAL REGULATORY STATUS



ANALYSIS: REGULATORY STUDIES IN UPPER 6 GHz BAND

GLOBAL REGULATORY STATUS



ITU-R WP 5D MEETING #48 SHARING & COEXISTENCE STUDIES

GLOBAL REGULATORY STATUS

EXISTING ADJACENT SERVICES ANALYSIS



Fixed Service (FS): Operational terrestrial point-to-point microwave communication links.



Fixed-Satellite Service (FSS): Existing Earth-to-space uplinks and space-to-Earth downlinks.



Radio Astronomy Service (RAS): Critical passive research and observations at specified frequencies.

Note: Regulatory emphasis on ensuring adjacent-channel coexistence and interference mitigation.

ANALYSIS: EXISTING ADJACENT SERVICES IN UPPER 6 GHz BAND

Future IMT Operations: 6425– 7125 MHz

IMT-2030 / 6G Operations
Primary Spectrum for High-Capacity Connectivity

Adjacent Channel Coexistence

↓ Below 6425 MHz

Fixed Service
Microwave Links

Broadcast Aux.
Contribution Links

EESS (Passive)
Earth Exploration



↑ Above 7125 MHz

Fixed Satellite
Space-to-Earth (FSS)

Radio Astronomy
& Space Research

Radiolocation
Radar & Navigation

Future IMT Operations: 6425–7125 MHz

IMT-2030 / 6G Operations

Primary Spectrum for High-Capacity Connectivity



Adjacent Channel Coexistence

↓ Below 6425 MHz



Fixed Service

Microwave Links



Broadcast Aux.

Contribution Links



EESS (Passive)



↑ Above 7125 MHz



Fixed Satellite Space-to-Earth (FSS)



Radio Astronomy & Space Research



Radiolocation

Radar & Navigation

Existing Services Adjacent to the Upper 6 GHz Band

↓ BELOW 6425 MHz: FIXED & AUXILIARY

Fixed Service (FS)

- Point-to-point microwave
- Telecom backhaul
- Public safety & Utility

Broadcast Aux. / EESS

- Studio-to-transmitter
- Electronic news gathering
- Passive Earth sensing

Concern: OOB interference with highly directional microwave receivers and extremely sensitive passive sensors.

↑ ABOVE 7125 MHz: SATELLITE & SCIENCE

Fixed Satellite (FSS)

- Satellite gateways
- Teleports
- Earth stations

Research & Astronomy

- Deep-space comms
- Scientific missions
- Weak cosmic signals

Concern: High-power IMT emissions causing adjacent-band interference to very high sensitivity receivers.

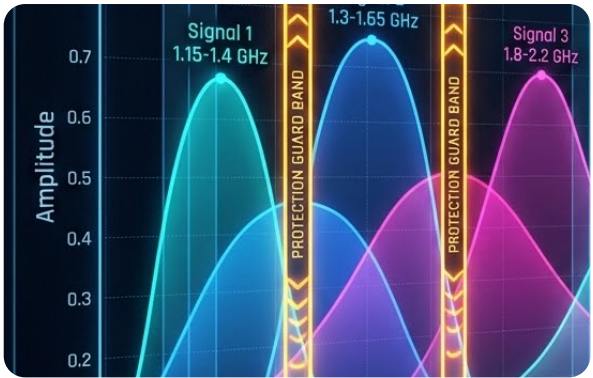
RADIOLOCATION / RADAR APPLICATIONS

- Weather radar systems
- Airport surveillance radar
- Defense & Security systems



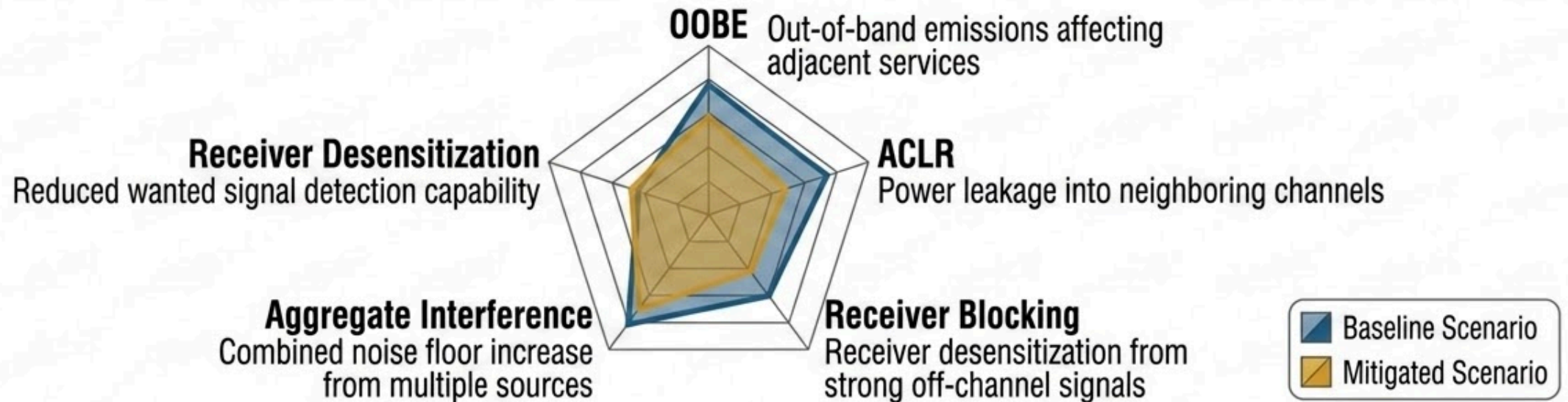
Coexistence Challenge: Risk of receiver blocking and desensitization due to high-density IMT deployments.

TECHNICAL COEXISTENCE SUMMARY



GLOBAL REGULATORY STATUS

COEXISTENCE CHALLENGES

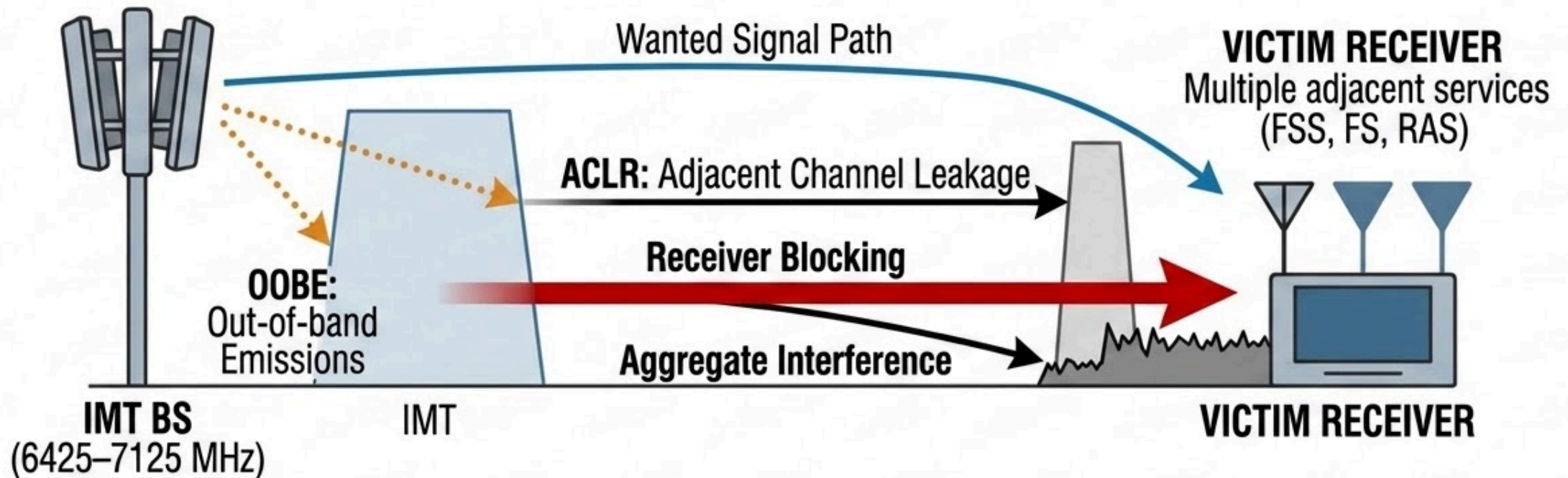


Note: Balancing interdependent interference vectors is essential for successful spectrum sharing and next-gen standard development.

ANALYSIS: COEXISTENCE INTERFERENCE VECTORS

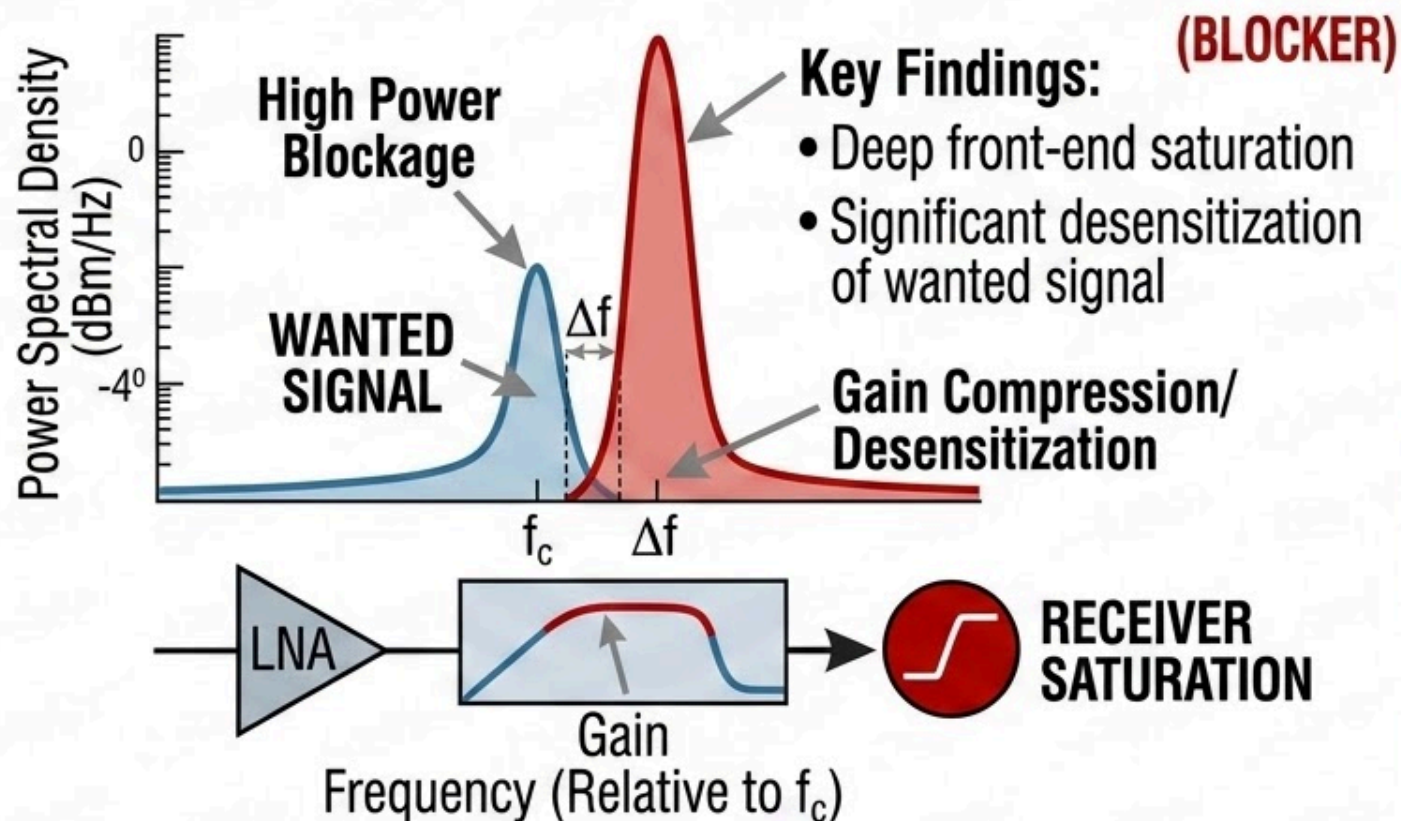
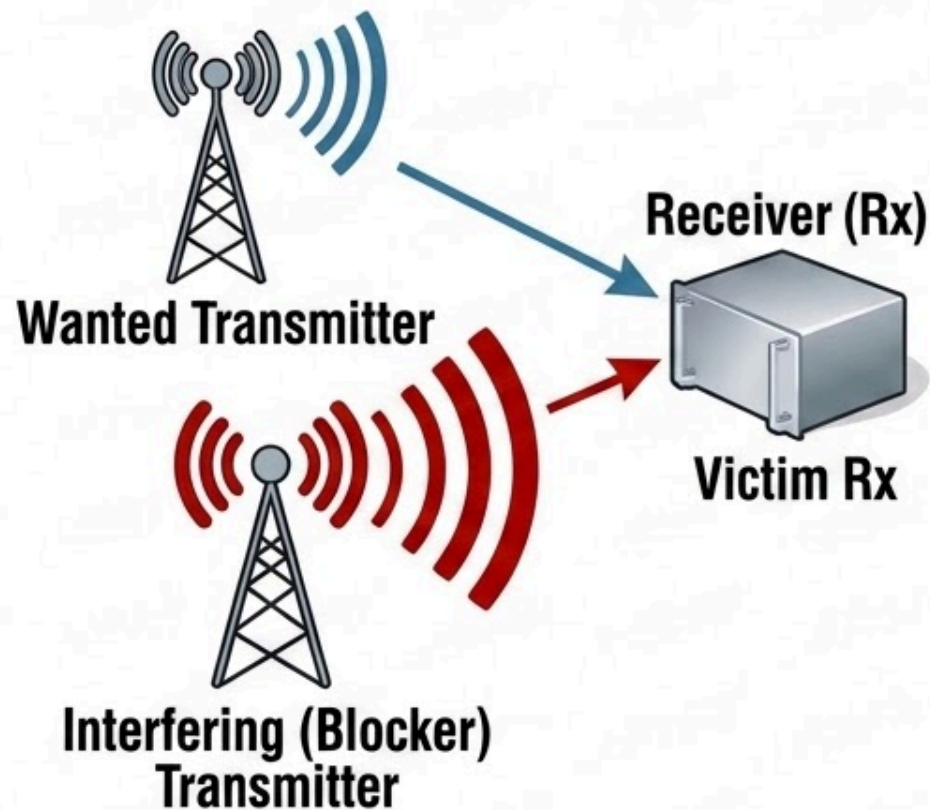
GLOBAL REGULATORY STATUS

INTERFERENCE MECHANISMS: IMT BS ---> VICTIM RECEIVER



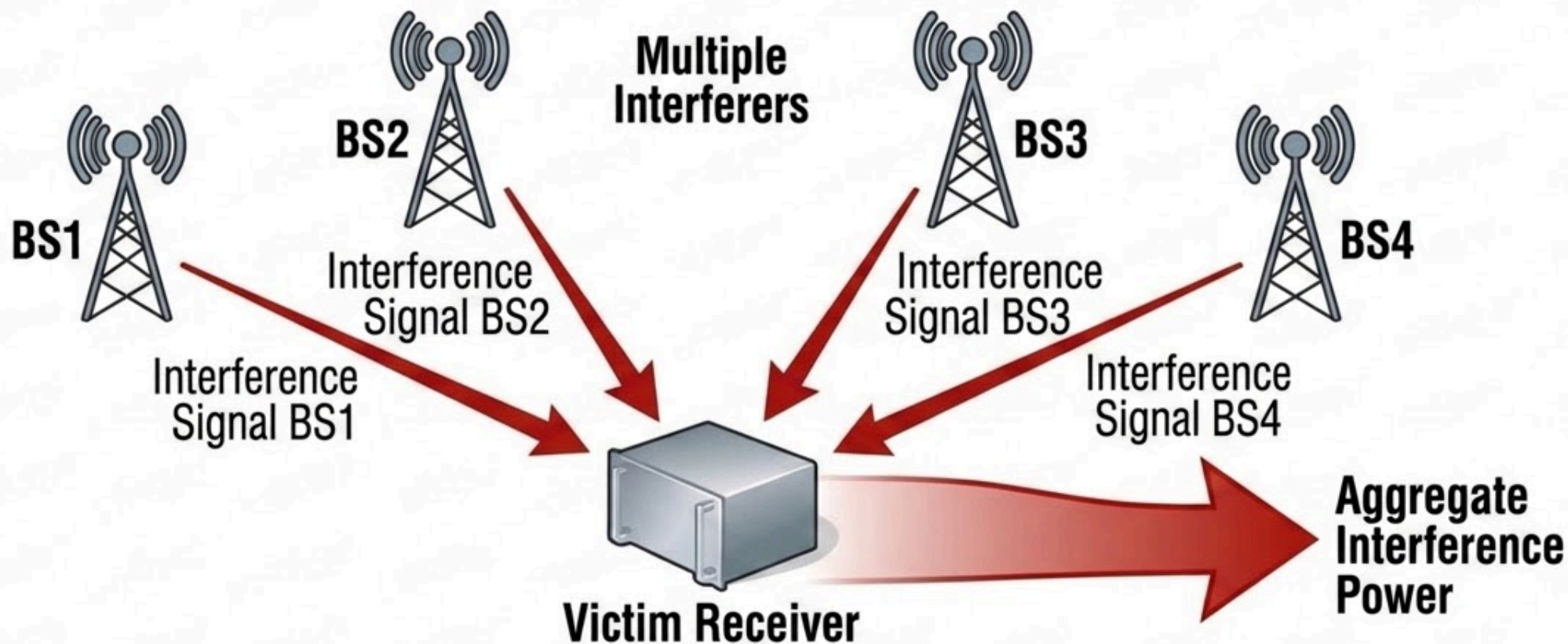
Note: Visual representation of primary interference vectors affecting existing services from future IMT operations.

RECEIVER BLOCKING ANALYSIS



Note: Significant desensitization of the receiver front end caused by a high-power unwanted signal in adjacent or nearby bands.

AGGREGATE INTERFERENCE ANALYSIS



Note: The combined effect of multiple interfering signals, leading to significant degradation in Signal-to-Interference-plus-Noise Ratio (SINR).

Sharing Guidelines for 6425–7125 MHz Co-existence

Ensuring Seamless Integration with Future IMT & 6G Operations



Future Spectrum

Focused on IMT and 6G spectrum evolution for next-gen connectivity.



Coexistence

Strategies for adjacent-channel coexistence to minimize interference.



Regulatory

Establishing clear sharing and regulatory guidelines for global standards.

Coexistence Challenges



Out-of-band Emissions

Management of OOB Emissions to prevent interference with services outside the primary band.



Adjacent Channel Leakage

Minimizing power leakage into neighboring frequency channels for system integrity.



Receiver Blocking

Mitigating receiver desensitization caused by strong interfering signals.



SINR & Throughput

Analyzing the direct impact of interference on Signal-to-Interference-plus-Noise Ratio.

International Regulatory Landscape



ITU Framework

Comprehensive studies conducted within the International Telecommunication Union framework.



3GPP Upper 6 GHz

Technical evaluation of the upper 6 GHz band for IMT-2030 and 6G development.



Regional Coexistence

Detailed localized studies to ensure interference-free operation across different regions.



Balanced Utilization

Optimizing spectrum efficiency while protecting existing adjacent channel services.

Technical Sharing Guidelines



Emission & OOBE

Defining strict emission masks and Out-of-Band Emission (OOBE) limits to prevent interference.



Guard Bands

Implementation of safety buffers near band edges to ensure clean spectral separation.



Receiver Filtering

Advanced receiver filtering requirements to minimize sensitivity to unwanted signals.



Coordination Mechanisms

Standardized protocols for seamless multi-operator coordination and sharing.

Advanced Interference Mitigation



AI Spectrum Management

Intelligent, real-time allocation and optimization of frequency resources using AI algorithms.



Adaptive Power Control

Dynamic adjustment of transmission power levels to minimize cross-channel interference.



Beamforming & Isolation

Spatial filtering and isolation techniques to target signals precisely and reduce noise.



Digital-Twin Planning

Simulation-based network planning using virtual replicas for predictive interference modeling.

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Digital-Twin Planning



Simulation-based network planning using virtual replicas for predictive interference modeling.

Multi-Layer Coexistence Framework



Regulatory Limits

Defining legal boundaries and operational constraints for spectrum usage.



Guard Bands

Implementation of safety buffers near band edges for spectral separation.



Receiver Filtering

Advanced requirements to minimize sensitivity to unwanted signals.



AI-Based Coordination

Intelligent, real-time allocation and optimization of frequency resources.



Continuous Monitoring

Ongoing spectral sensing and analysis to ensure compliance and efficiency.

Key Recommendations



Harmonized standards

Unified approaches for global compatibility



Realistic coexistence studies

Accurate impact assessments of spectral sharing



Robust receiver specifications

Enhanced performance and interference rejection

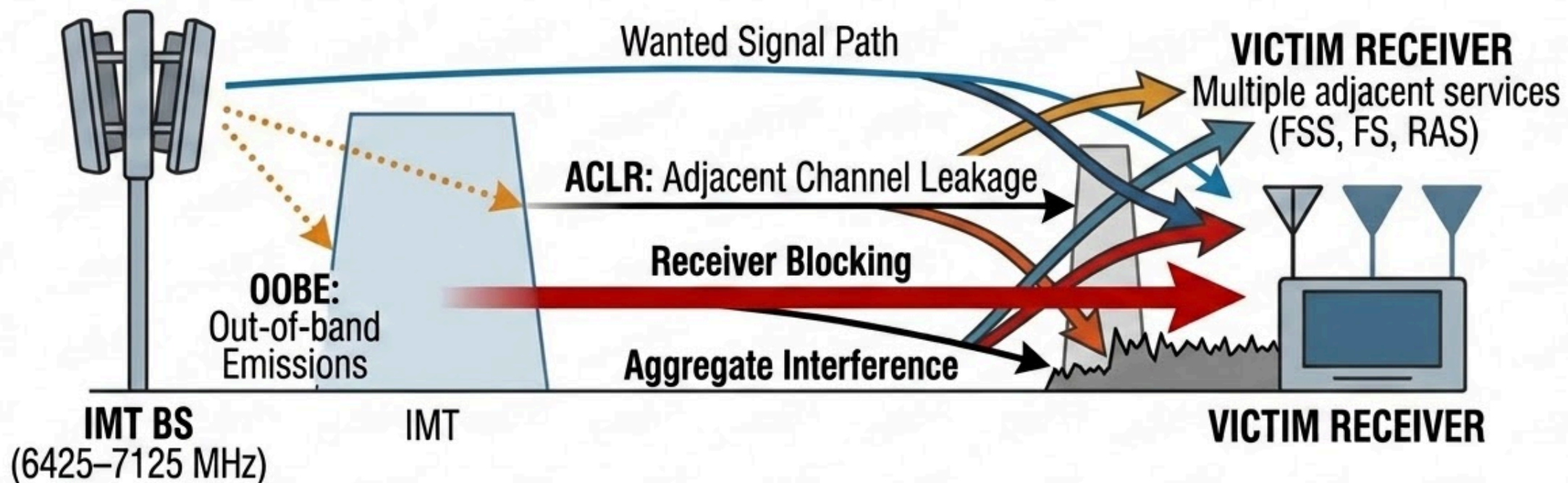


AI-driven sharing mechanisms

Intelligent, real-time frequency allocation

GLOBAL REGULATORY STATUS

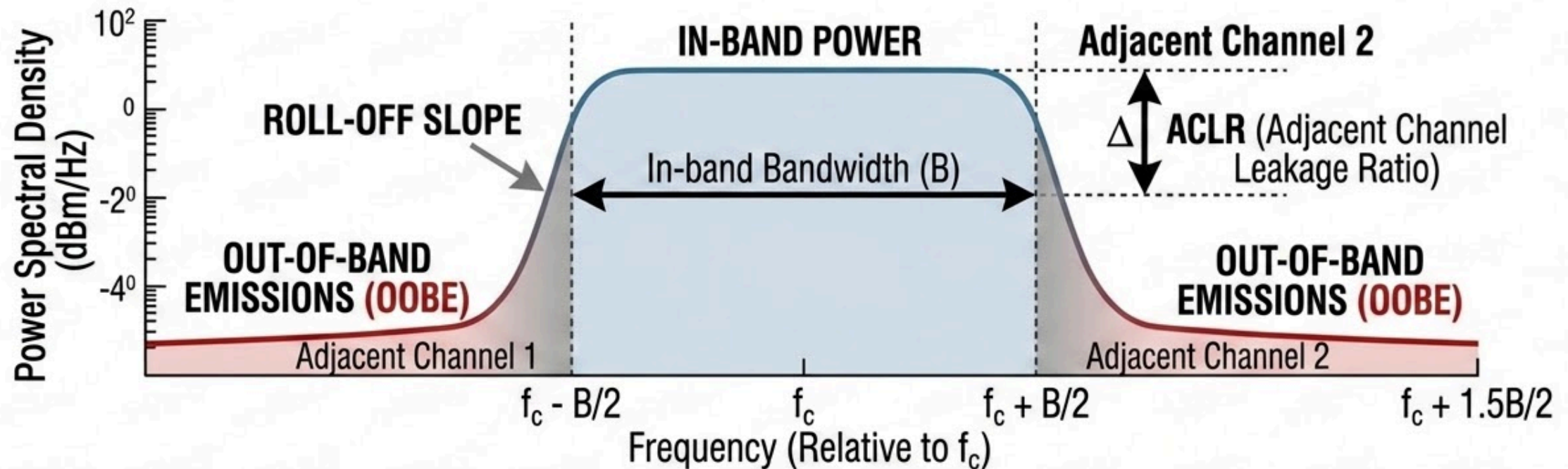
INTERFERENCE MECHANISMS: IMT BS ---> VICTIM RECEIVER



Note: Visual analysis of primary interference vectors affecting existing services from future IMT operations.

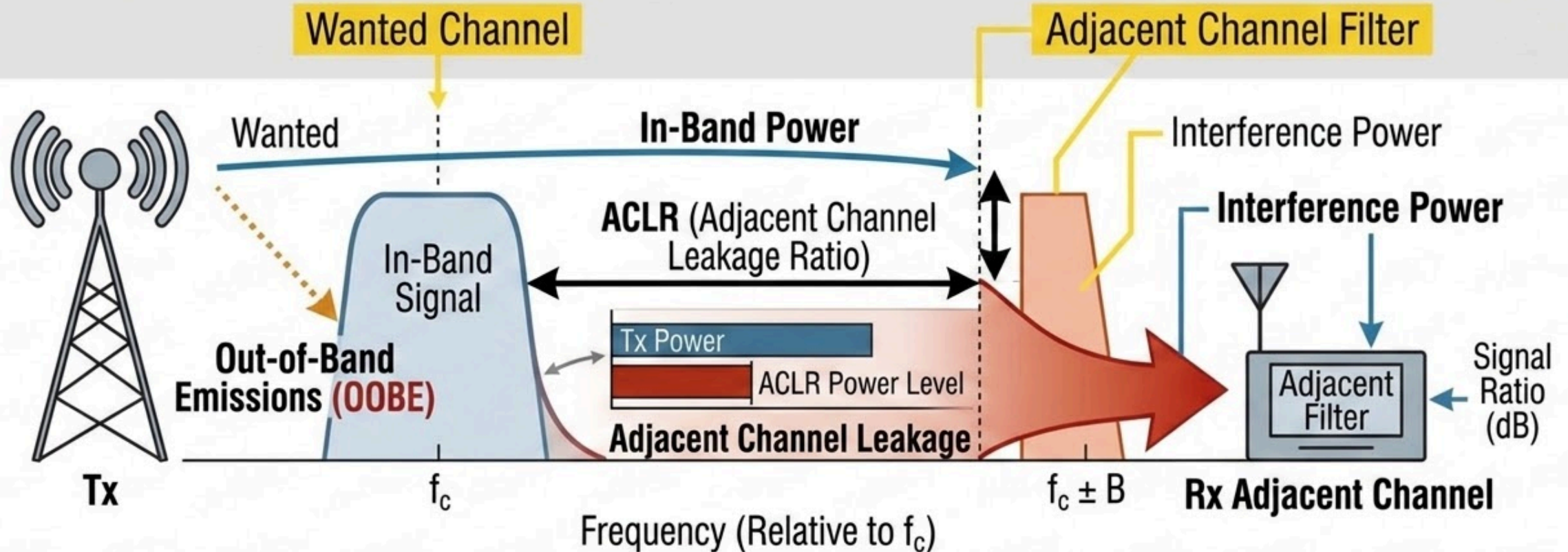
OOBE CONCEPT: POWER SPECTRAL DENSITY ANALYSIS

POWER SPECTRAL DENSITY (PSD) CURVE: OOBE DEFINED



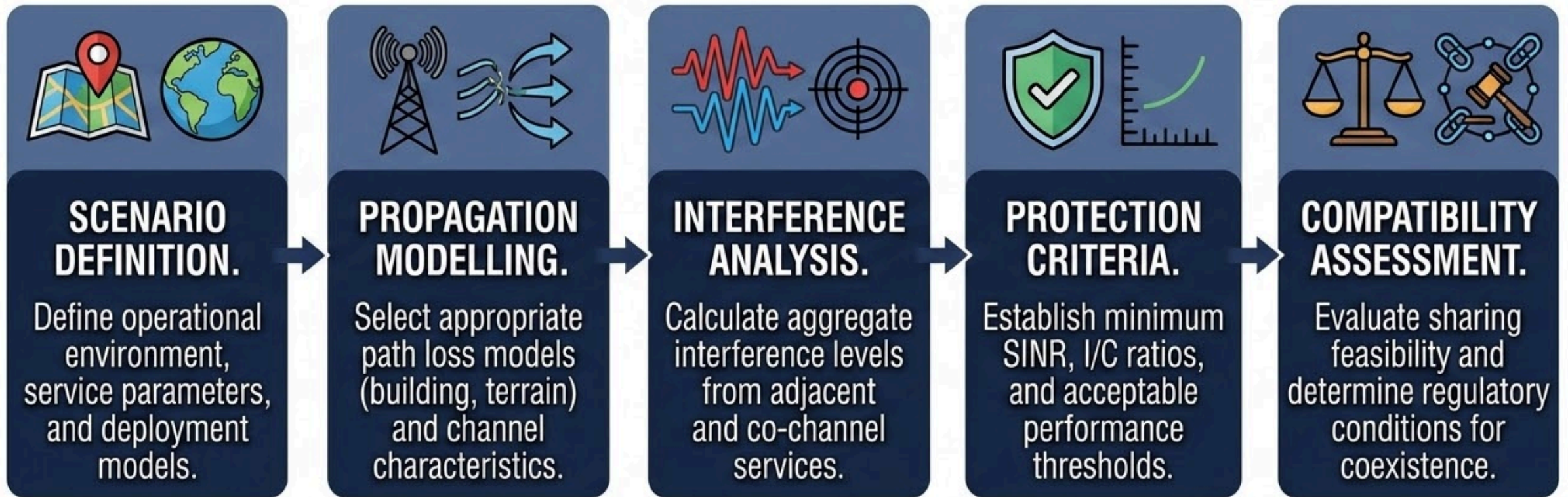
Note: The OOBE is defined as emissions on frequencies immediately adjacent to the necessary bandwidth which result from the modulation process.

ADJACENT CHANNEL LEAKAGE (ACLR) ANALYSIS



Note: Visual illustration of power leakage from a transmitted channel into adjacent operating bands, defined by specific mask requirements to protect existing services.

ITU-R FRAMEWORK



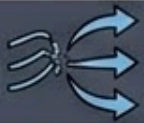
Note: The systematic ITU-R study process ensures technical compatibility and regulatory harmonization for global spectrum usage.

ITU-R FRAMEWORK



1. SCENARIO DEFINITION.

Define operational environment, service parameters, and deployment models.



2. PROPAGATION MODELLING.

Select appropriate path loss models (building, terrain) and channel characteristics.



3. INTERFERENCE ANALYSIS.

Calculate aggregate interference levels from adjacent and co-channel services.



4. PROTECTION CRITERIA.

Establish minimum SINR, I/C ratios, and acceptable performance thresholds.



5. COMPATIBILITY ASSESSMENT.

Evaluate sharing feasibility and determine regulatory conditions for coexistence.

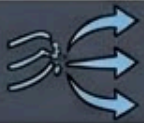
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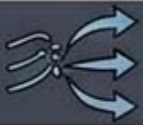
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ITU-R FRAMEWORK: PROTECTION METRICS



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2. PROPAGATION MODELLING.

Select appropriate path loss models (building, terrain) and channel characteristics.



3. INTERFERENCE ANALYSIS.

Calculate aggregate interference levels from adjacent and co-channel services.

I/N



KEY SHARING & COEXISTENCE PROTECTION METRICS

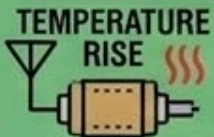
C/I



Carrier-to-Interference Ratio

Assess aggregate noise increase in the victim receiver caused by interference.

$\Delta T/T$



$\Delta T/T$

Noise Temperature Increase Ratio



Noise Temperature Increase Ratio

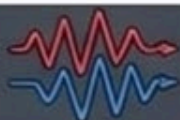
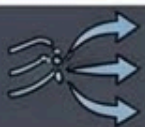
Limit fractional system temperature rise, critical for protecting sensitive passive services.

Note: Standardized metrics allow for quantifiable interference analysis and the establishment of objective compatibility criteria.

ITU-R FRAMEWORK: PROTECTION METRICS

2. PROPAGATION MODELLING.

Input User Prompt: Propagation Models Visual Comparison: Free-space Rural Urban Indoor



Free-Space

IDEAL LINE-OF-SIGHT (LOS) PATH LOSS ($1/r^2$)



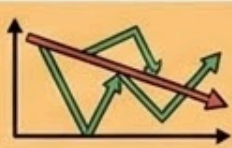
Rural

OPEN TERRAIN, GROUND REFLECTION & SCATTERING



Urban

DENSE BUILDINGS, MULTIPLE REFLECTIONS & DIFFRACTION



Indoor

WALL PENETRATION & COMPLEX MULTIPATH EFFECTS



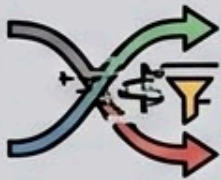
Note: Visualizing model differences allows for selection of appropriate path loss calculations based on operational environments.

TECHNICAL SHARING GUIDELINES: EMISSION MASK REQUIREMENTS



Strict OOB Limits.

Define legal boundaries for non-intentional power levels in adjacent frequency bands.



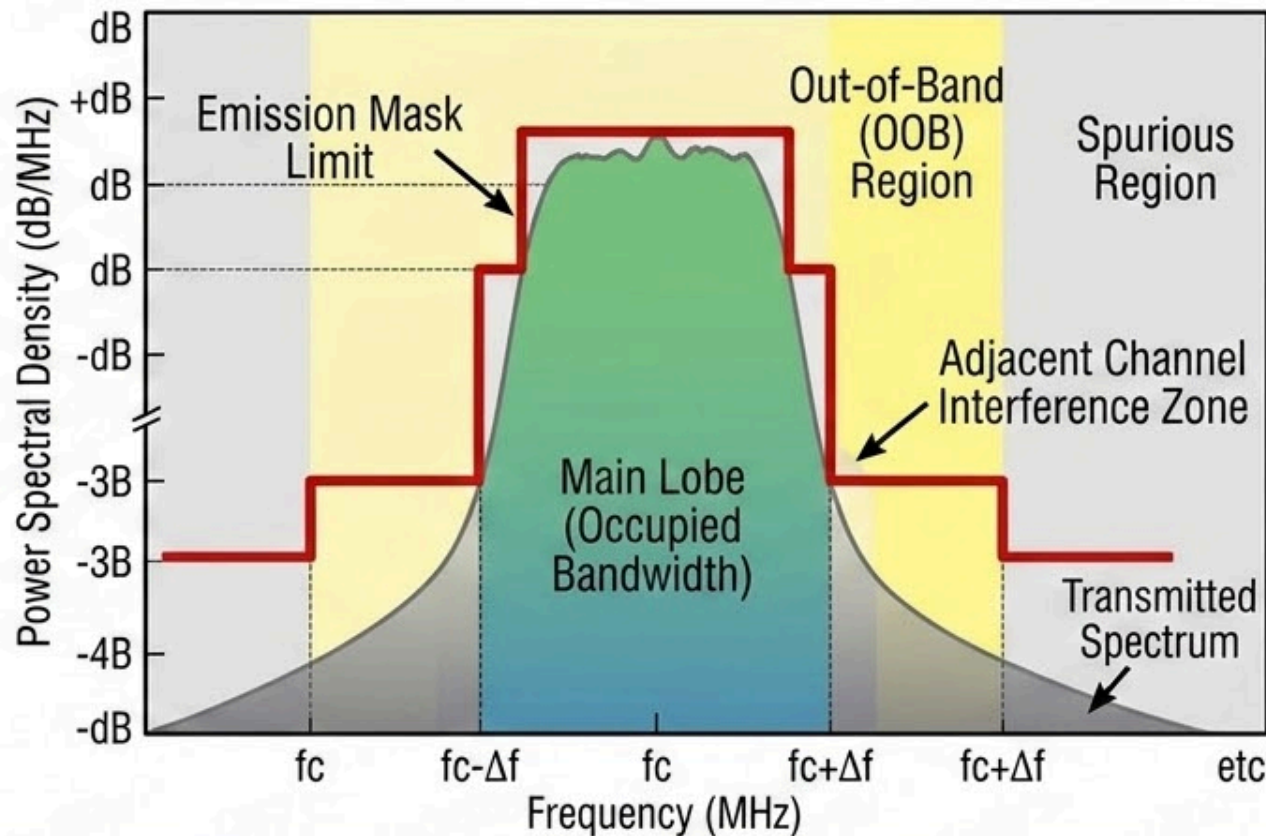
Interference Mitigation.

Essential for ensuring coexistence with surrounding systems.



Frequency Specific.

Mask shape varies with distance from the carrier center frequency.

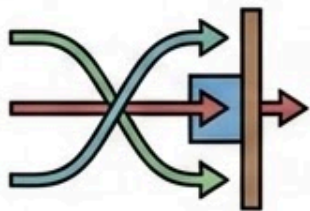


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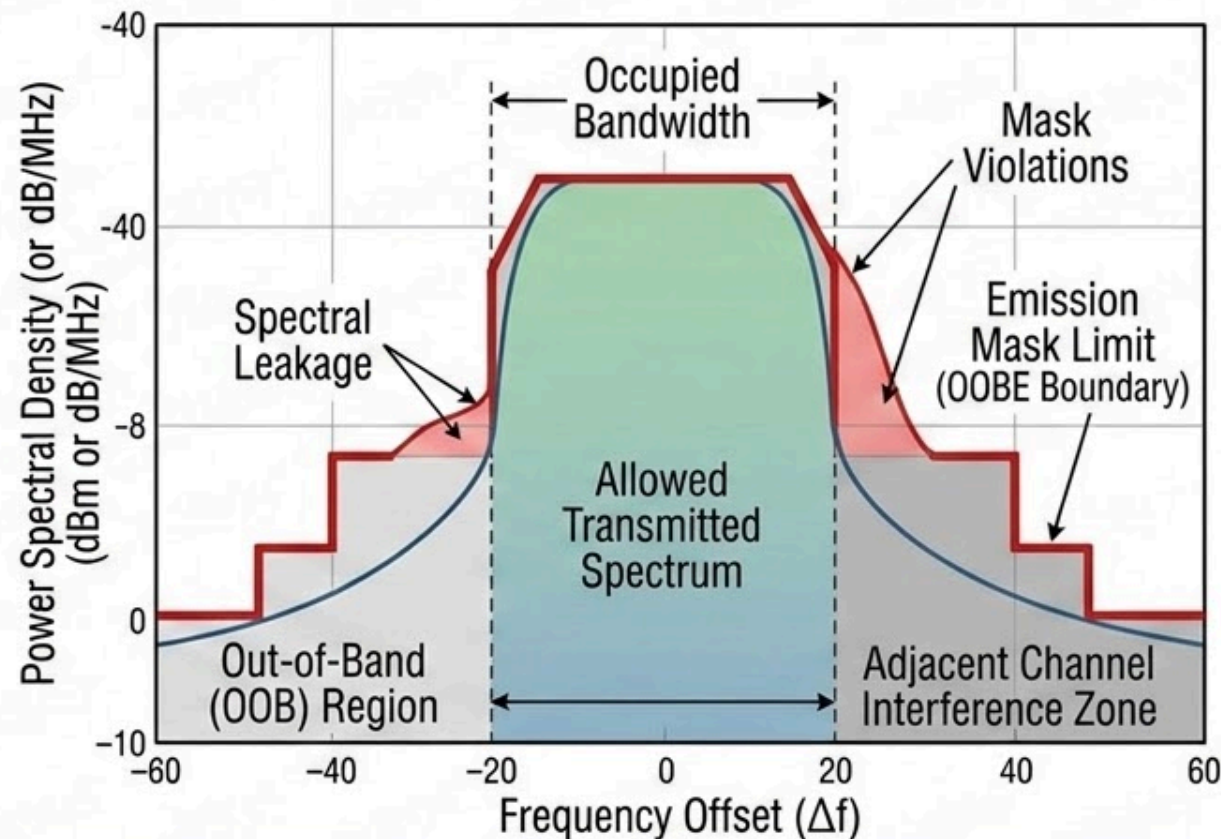
Interference Mitigation.

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Harmonized Standards.

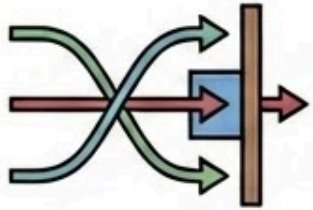
Global adherence to unified mask specifications.



EMISSION MASK REQUIREMENTS

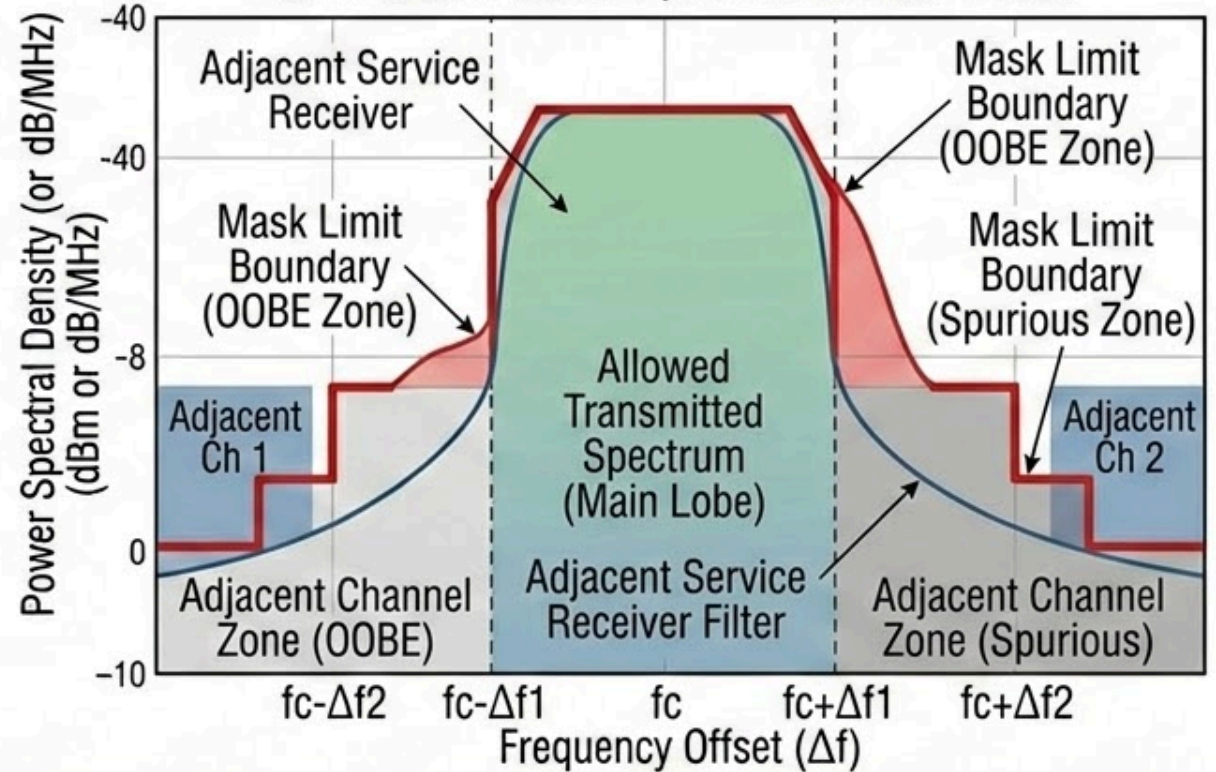


Define limits for unwanted emissions to control interference to adjacent channel services.



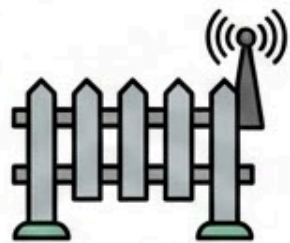
Compliance with international standards for spectral coexistence and regulatory alignment.

OOBE MASK REQUIREMENTS PLOT





GUARD BAND STRATEGY: EMISSION MASK APPROACH



Define Guard Band.
Create frequency buffers to ensure separation between adjacent services.

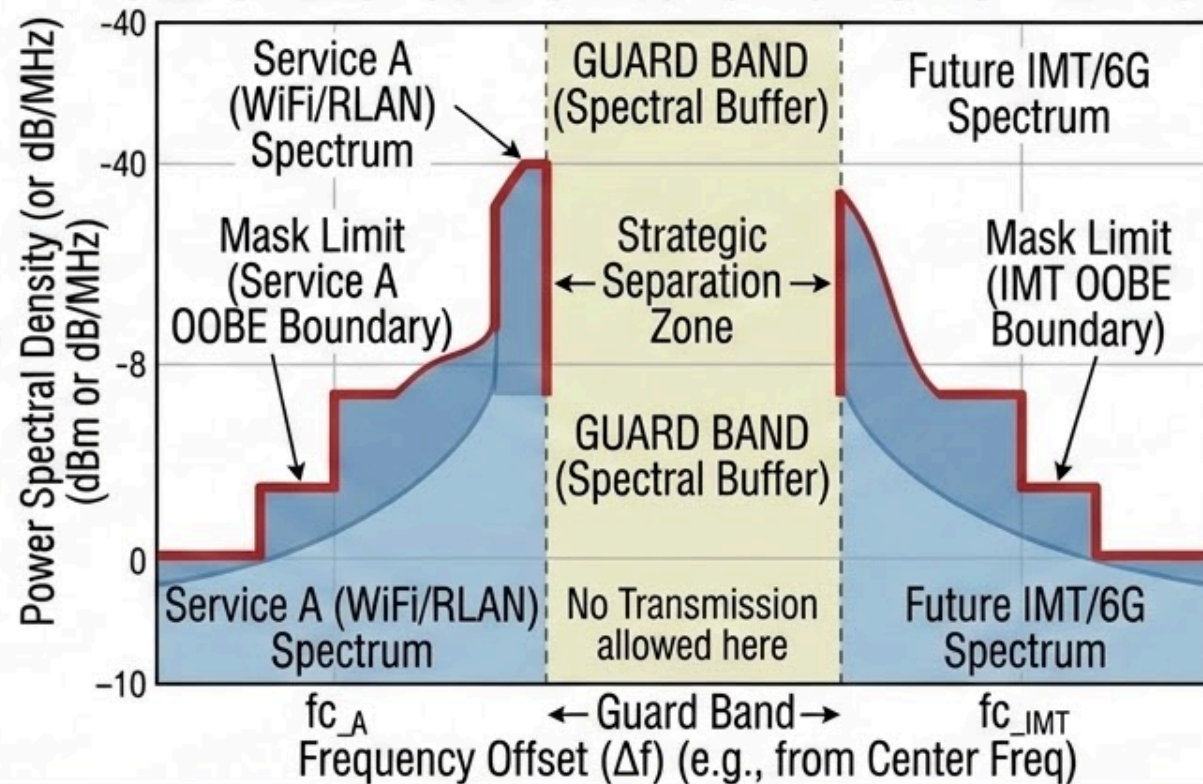


Regulatory Guard Band (RGB).
Mandatory spectral distance defined by regulators.



Technical Guard Band (TGB).
Additional filter-based isolation and equipment-specific margins.

MULTI-SERVICE COEXISTENCE SPECTRUM UTILIZATION





COORDINATION MECHANISMS



Coordination Mechanisms.

Protocols for dynamic information exchange and conflict resolution.



Spectrum Database. Centralized repository of spectral assignments, license status, and utilization data.

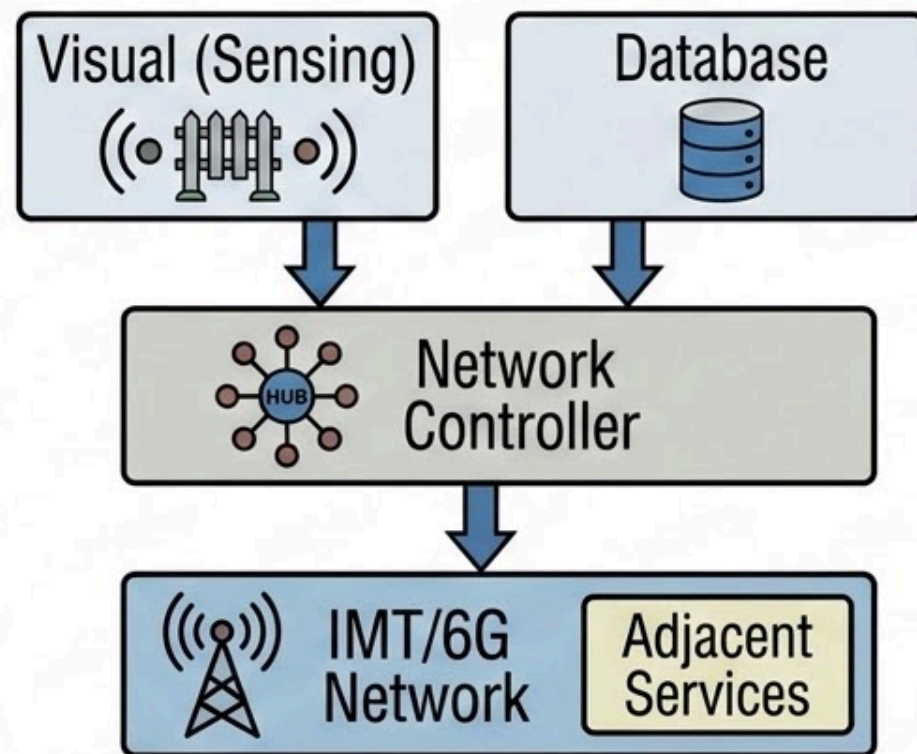


Network Controller. Intelligence engine managing dynamic resource allocation based on database and visual inputs.



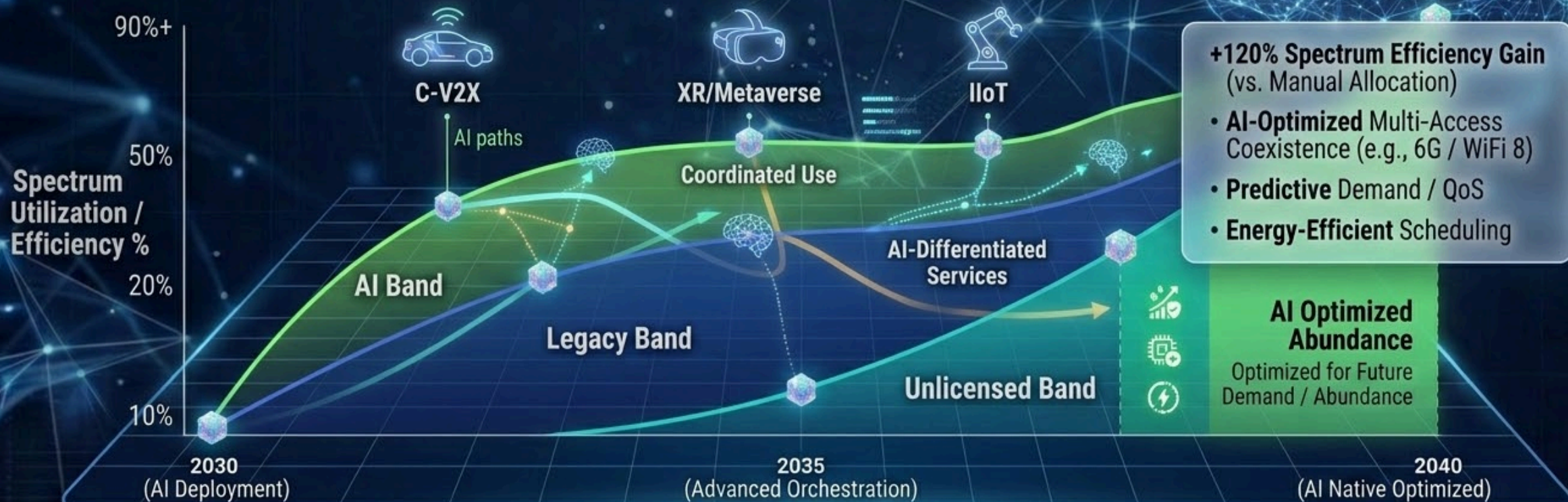
IMT/6G Network. Dynamic network adjustments and interference avoidance.

DYNAMIC SPECTRUM COORDINATION FLOW



AI Native Spectrum Sharing (2030–2040)

AI-Powered Orchestration for Dynamic Multi-Access Coexistence





DYNAMIC SPECTRUM SHARING FOR 6G



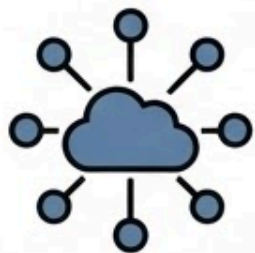
Dynamic Resource Management.

Real-time optimization of frequency and time allocations.



Interference Avoidance.

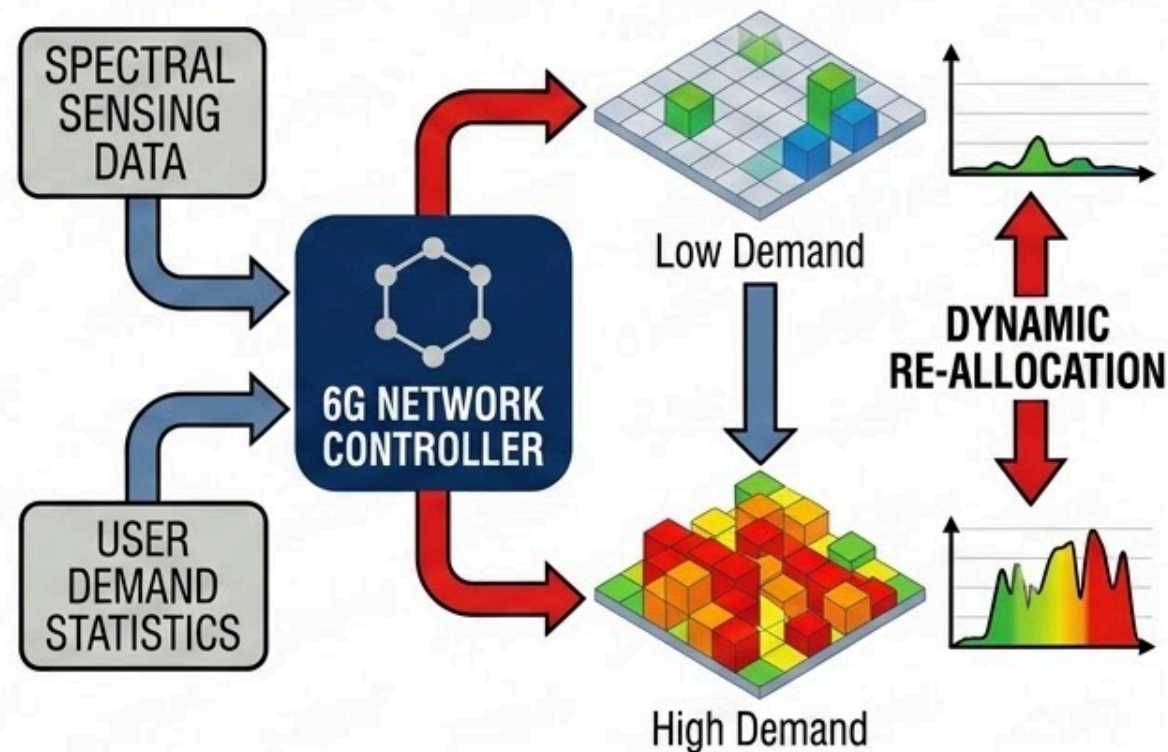
Predictive modeling and rapid response to changing signal conditions.



Multi-Service Coexistence.

Seamless sharing between 6G, IMT, and incumbent systems.

ADAPTIVE ALLOCATION FLOW (REAL-TIME)





DYNAMIC SPECTRUM SHARING FOR 6G



Dynamic Resource Management.
Real-time optimization of frequency and time allocations.

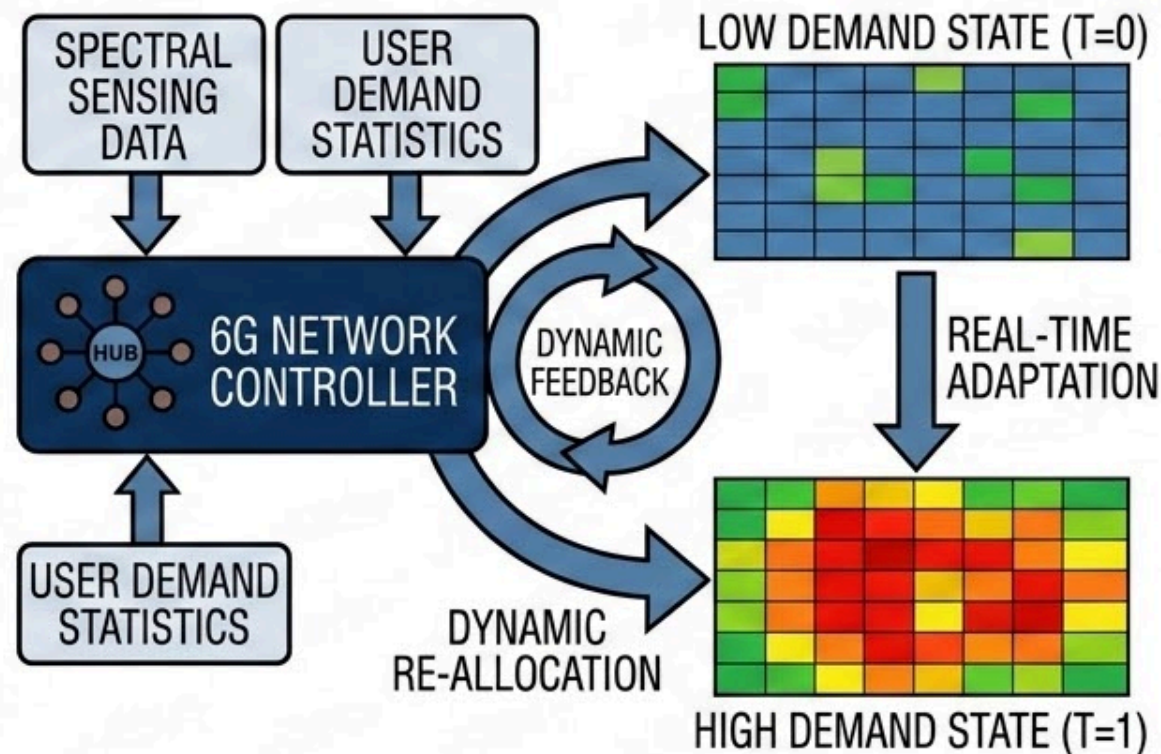


Interference Avoidance.
Predictive modeling and rapid response to changing signal conditions.



Multi-Service Coexistence.
Seamless sharing between 6G, IMT, and incumbent systems.

ADAPTIVE ALLOCATION FLOW (REAL-TIME)





6G SPECTRUM SHARING: INDIA RECOMMENDATIONS



Receiver Standards

Enhanced adjacent channel selectivity;
Minimum blocking performance;
Interoperability certifications.



Guard Bands & Emission Limits

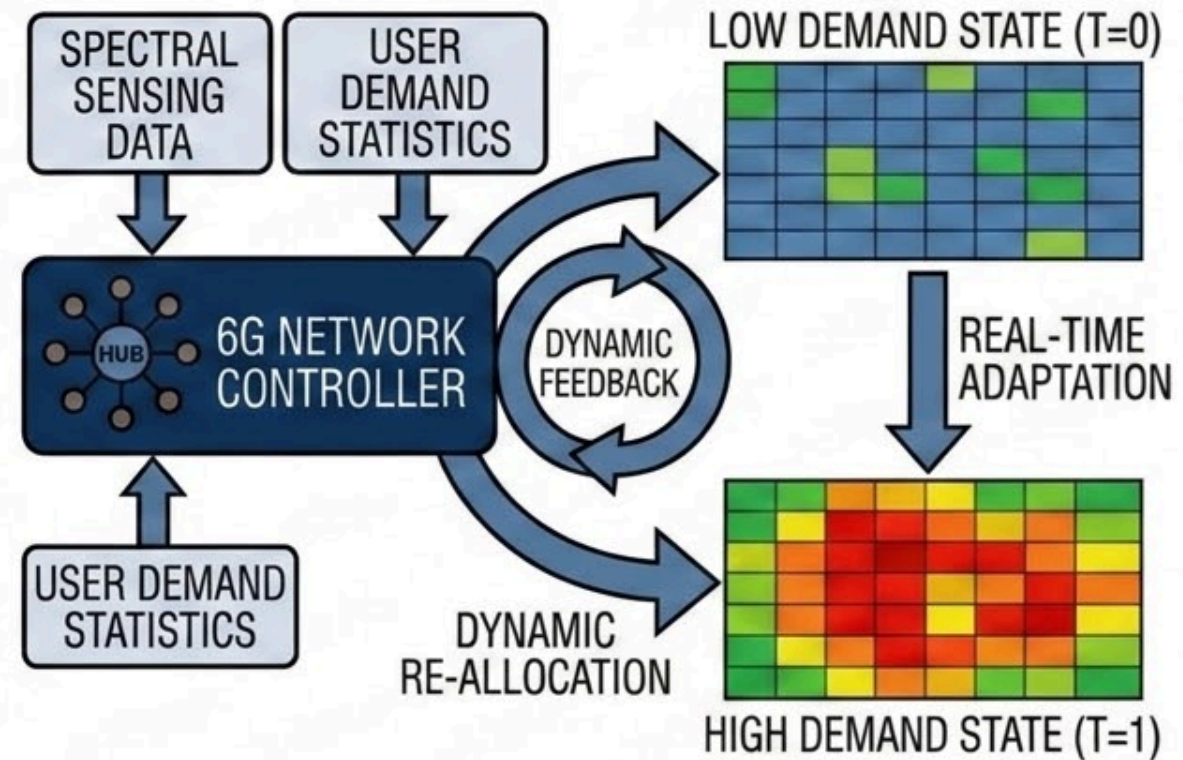
Optimized guard bands near 6 GHz edges;
Strict Out-of-Band Emission (OOBE)
masks; Standardized regulatory masks.



AI Coordination & Monitoring

Real-time dynamic re-allocation (see Flow);
Continuous spectral sensing data;
Multi-stakeholder coordination protocols.

ADAPTIVE ALLOCATION FLOW (REAL-TIME)





6G SPECTRUM SHARING: INDIA RECOMMENDATIONS

FIVE-PILLAR FRAMEWORK



RECEIVER STANDARDS

Enhanced Adjacent Channel Selectivity;
Minimum Blocking Performance;
Interoperability Certifications.



GUARD BANDS & EMISSION LIMITS

Optimized Guard Bands Near 6 GHz Edges;
Strict Out-of-Band Emission (OOBE) Masks.



AI COORDINATION

Real-Time Dynamic Re-Allocation (see Flow);
Predictive Interference Modeling.



CONTINUOUS MONITORING

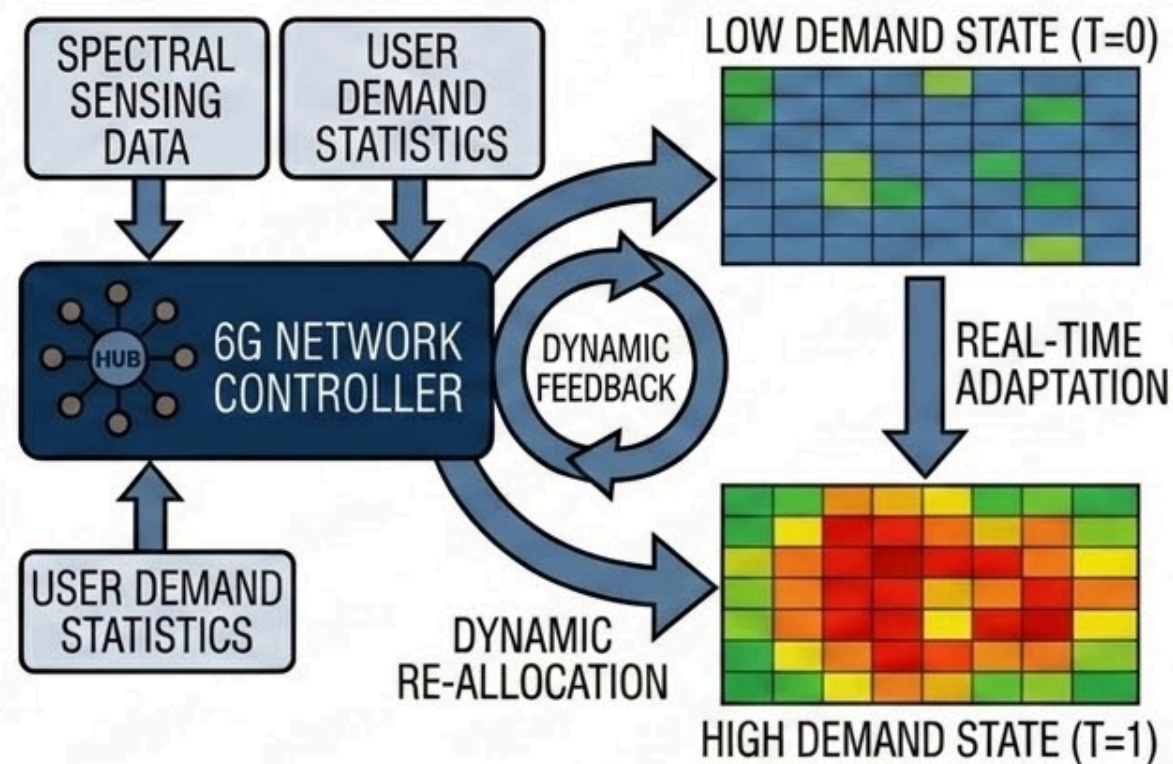
Real-Time Spectral Sensing Data Collection;
Comprehensive Network Performance Metrics.



REGULATORY WAY FORWARD (INDIA)

Harmonized Technical Guidelines for 6G;
State-wide Coordination Protocols.

ADAPTIVE ALLOCATION FLOW (REAL-TIME)



CONCLUSION & WAY FORWARD

STATUS: FINAL RECOMMENDATIONS ✓

Strategic Spectrum Value

The 6425–7125 MHz band is a **critical enabler** for IMT-2030/6G, offering the optimal balance between **broad coverage** and **high capacity**.

Coexistence Feasibility

- 🛡️ Adjacent-channel coexistence is **technically feasible**.
- ✓ Strict emission limits & guard bands
- 📡 Enhanced receiver standards
- 🔗 Coordination mechanisms

AI-Native Future

AI-native management and **digital twins** will be the backbone of dynamic sharing, enabling real-time interference mitigation in 6G ecosystems.

Global Roadmap

International harmonization and evidence-based studies are mandatory to maximize global utility while safeguarding incumbent services.

Wi-Fi and 5G technology likely similar

Category	Variable	5G	Wi-Fi 6 / Wi-Fi 6E
Technical	Peak data rate	 2 Gbps (DL), 1Gbps (UL)	 10 Gbps 8x8 (DL), 5 Gbps (UL)
Technical	MU-MIMO	 128x128	 8x8
Technical	Coverage range	 100-300m / tens of cells, up to tens of km for macro cells	 <50m indoor / 300m outdoor meters outdoor
Technical	Carrier aggregation	 Yes	 Yes, 40, 80, 160 (or 80+80)
Technical	Inter-cell interference	 Controlled	 Mainly uncontrolled
Technical	Channel Access Scheme	 OFDMA	 OFDMA
Spectrum	License type	 Mostly licensed	 Unlicensed
Spectrum	General bands	 Low, mid and high	 Low and mid
Spectrum	Specific frequencies	700 MHz, 3.5 GHz, 36 GHz, 60 GHz	2.4 GHz, 5 GHz, 6 GHz
Spectrum	Channel Bandwidth	20, 40, 80, 100 MHz	20, 40, 80, 160 MHz
Business model and cost	Revenue model	 Pre- or post-pay billing data services	 None ("Piggybacks") on fixed broadband connections
Business model and cost	User equipment price	 High (>=\$300)	 None ("Piggybacks")
Business model and cost	Public versus private	 High (>=\$300)	 Low (>=\$100)
Business model and cost	Chip/modem cost	 Traditionally publicly provided	 Traditionally privately provided
Business model and cost	Data cost	 High (\$10-50)	 Low (\$1-5)
Installation and skills	Deployment approach	 Monthly subscription (\$5-20)	 Free ("piggybacks")
Installation and skills	Installation skill level	 Controlled and managed	 Uncontrolled and unmanaged
Installation and skills	Development skill level	 High	 Low

Communication networks as of Today



INDOOR & SHORT RANGE

Fixed function peripherals (Short range)

Earphones, mouse, keyboards, smart watches

Bluetooth

Low monthly bandwidth cost

Residential

Wi-Fi

High Bandwidth Indoors

Large Enterprises, University lecture halls

Wi-Fi, 5G hotspots, 5G private NWs



OUTDOOR & HIGH BANDWIDTH

High Bandwidth Outdoors

Stadiums, outdoor concerts
(spectators, cameras)

5G mmWave

Outdoor, but regional or urban

Public transit, metering, traffic signage

NB-IOT, LTE-M, LoRAWAN



SPECIALIZED & REMOTE

Outdoor, on major roads

V2I, connected
vehicles

DSRC, LTE, 5G?

Outdoor (Air to ground)

UAVs

Wi-Fi, LTE, 5G?

Outdoor (Underwater)

AUVs, submarines

Acoustic, RF?

Rural

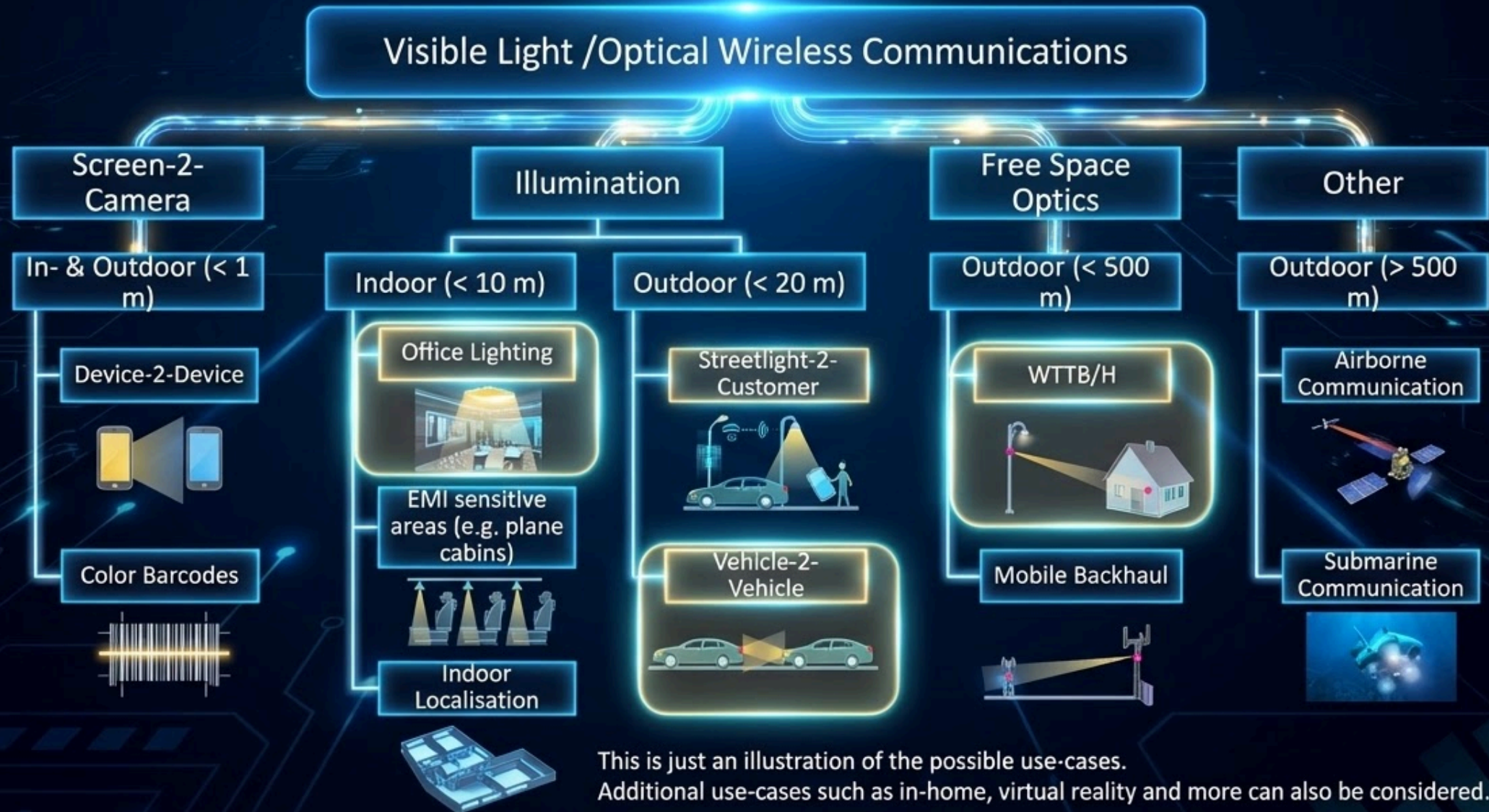
Rural hospitals,
dispensaries schools,
colleges, GPs

Cellular, satellite,
NOFN etc



**Can VLC/ Li-Fi create a space for itself
in today's communication networks?**

VLC... Use Cases



Why is Li-Fi important?



Spectrum Crunch Solution

Radiofrequency (RF) spectrum is running out. Li-Fi uses the vast, unlicensed visible light spectrum, alleviating the spectrum crunch.



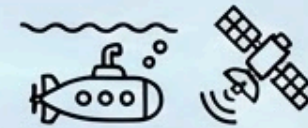
Enhanced Security (Military)

Li-Fi signals are confined to a specific area and do not penetrate walls, offering secure communication ideal for military use.



Remote & Difficult Locations

Li-Fi requires no complicated wiring, making it suitable for extremely remote locations where traditional infrastructure is impractical.



Underwater Communication

Light can penetrate deep water, enabling communication for underwater vehicles and divers, unlike radio waves which get absorbed.

Differences LiFi and WiFi



WiFi



LiFi

Technology	Radio frequencies	Light waves (visible light, infrared)
Speed	Up to 9.6 Gbps (WiFi 6)	Up to 100 Gbps
Range	30-100 meters	Limited to the area of light coverage
Interference	Susceptible to RF interference	Immune to RF interference
Security	Less secure (signals can leak through walls)	More secure (confined to light area)
Power Consumption	Higher energy consumption	More energy-efficient (uses LED)
Infrastructure	WiFi routers and access points	Light sources (LEDs) + receivers
Bandwidth	Limited by RF spectrum	Broad bandwidth (visible light)
Environment Compatibility	Works in most environments	Requires line of sight, not ideal in sunlight

WiFi is more versatile, offering wider coverage and flexibility, making it suitable for most everyday wireless needs. LiFi, on the other hand, excels in high-speed, secure, and interference-free communication, and it holds potential for specialized use cases like high-density environments, secure communications, and smart infrastructures where traditional WiFi may face limitations.

Thank you for your attention

Questions?

