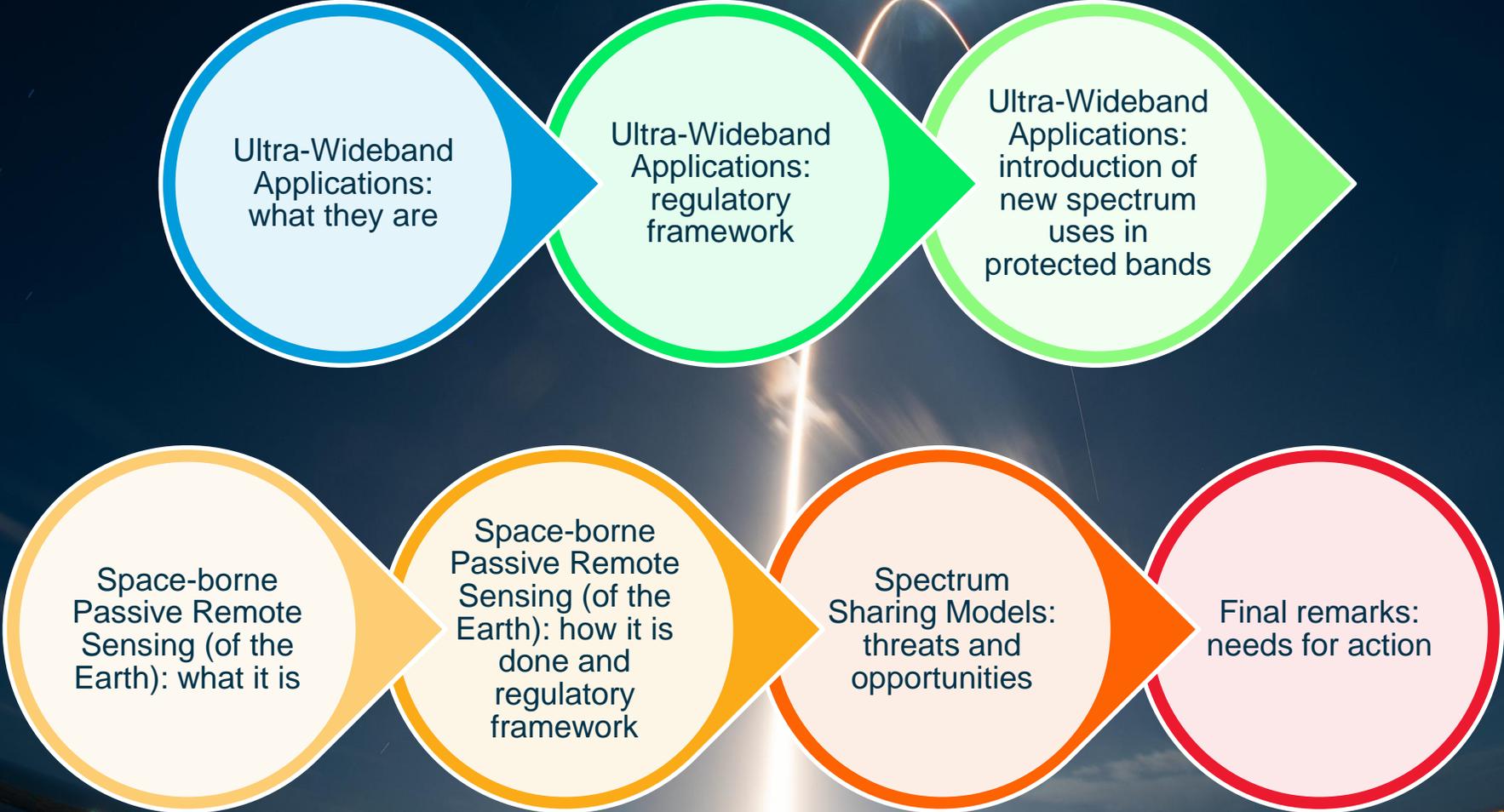


# Earth Observation Sensors in Purely Passive Bands and UWB Technologies: a Risk Analysis for Space-borne Passive Remote Sensing Applications Within the CEPT

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Flávio Jorge, Yan Soldo,  
Josep Rosello and Markus Dreis

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**UWB devices**  
are a subset of short-range devices (SRD) that use UWB technology, i.e., *technology involving the intentional generation and transmission of radio-frequency energy that spreads over a very large frequency range*



## UWB applications

can offer benefits to the public, consumers, businesses, and industries across different sectors, including public protection, construction, engineering, science, medical, consumer applications, information technology, multimedia entertainment and transportation

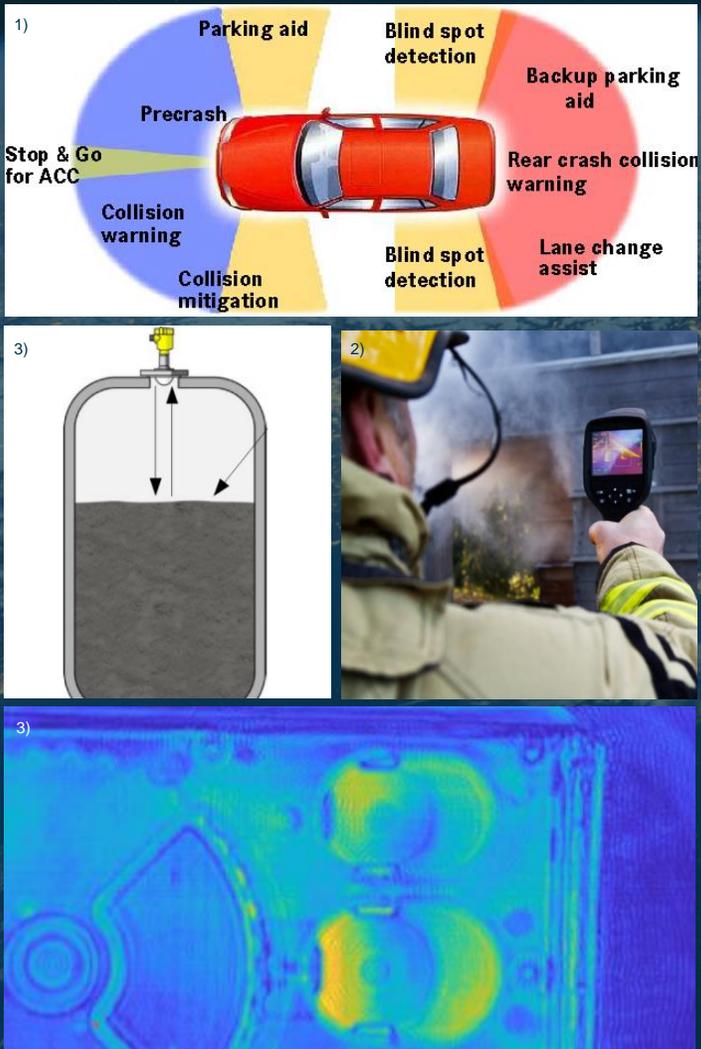
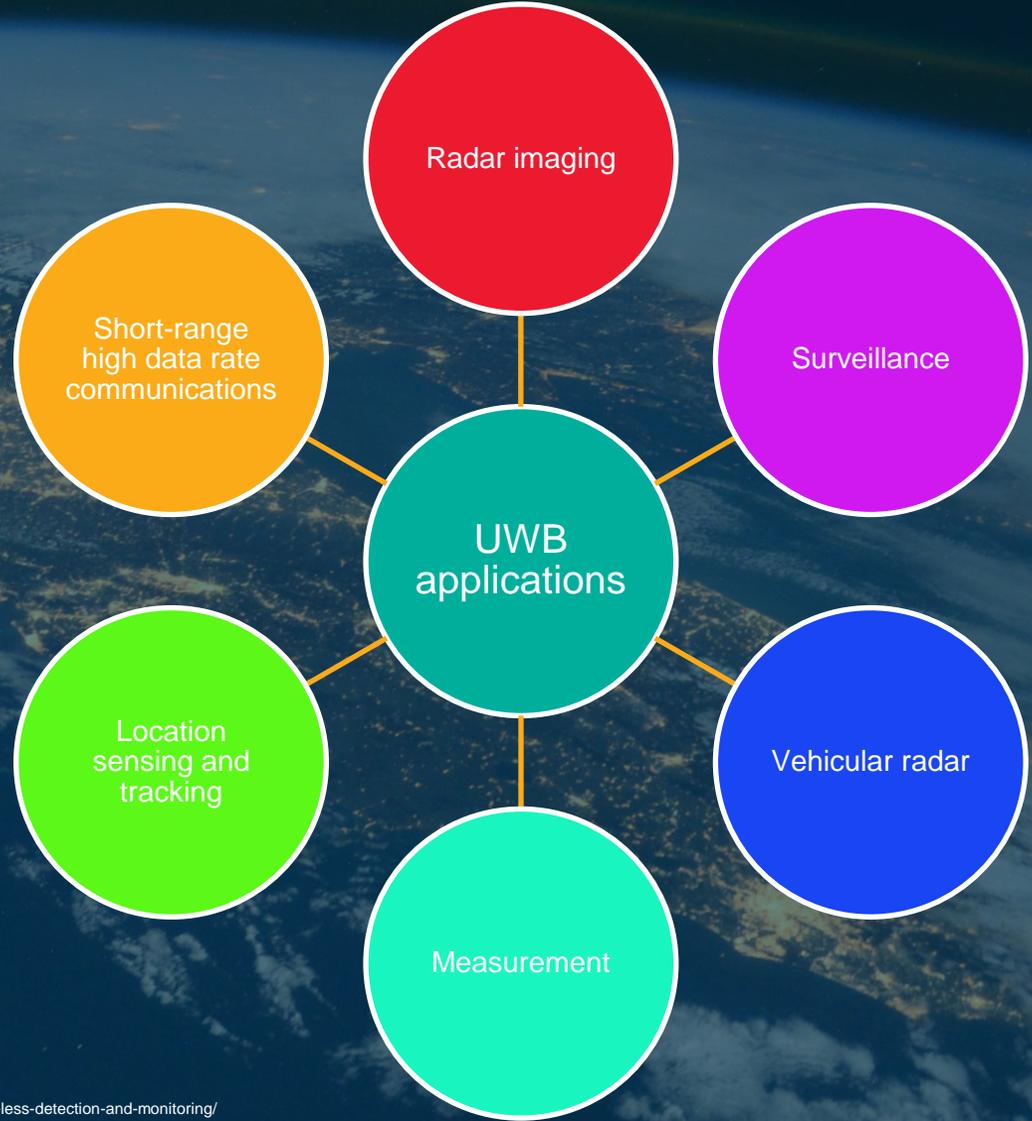


Image sources:  
 1) DOI:10.5194/ARS-7-61-2009  
 2) <https://innovation.kaust.edu.sa/technologies/low-complexity-ultra-wideband-uw-b-sensor-for-wireless-detection-and-monitoring/>  
 3) ECC Report 334



## UWB

### transmissions

may span numerous radiocommunication service allocations



**May impact**, simultaneously, **many** systems operating within a number of **radiocommunication services**, including those which are used internationally

### UWB devices

do not belong to any radiocommunication service



**Administrations** authorizing or licensing devices using UWB technology **should ensure**, pursuant to the provisions of the Radio Regulations, **that these devices, will not cause interference to**, and will not claim protection from, or place constraints on, the **radiocommunication services of other administrations** as defined in the Radio Regulations and operating in accordance with those Regulations



Upon receipt of a notice of interference to the radiocommunication services from devices using UWB technology, **administrations should take immediate action(s) to eliminate such interference**

## UWB devices

do not belong to any  
radiocommunication  
service



Administrations have a **sovereign right to regulate** the use of devices using UWB technology within their territory, provided that such devices do not impact stations of other administrations in accordance with the RR



**Special attention should be given** to provide the required protection to **services operating** in the frequency bands listed in RR No. 5.340 (i.e. where all emissions prohibited)

# Ultra-Wideband Applications: introduction of new spectrum uses in protected bands

The introduction of new spectrum uses for devices using UWB technology is cumbersome



# Space-borne Passive Remote Sensing (of the Earth): what it is

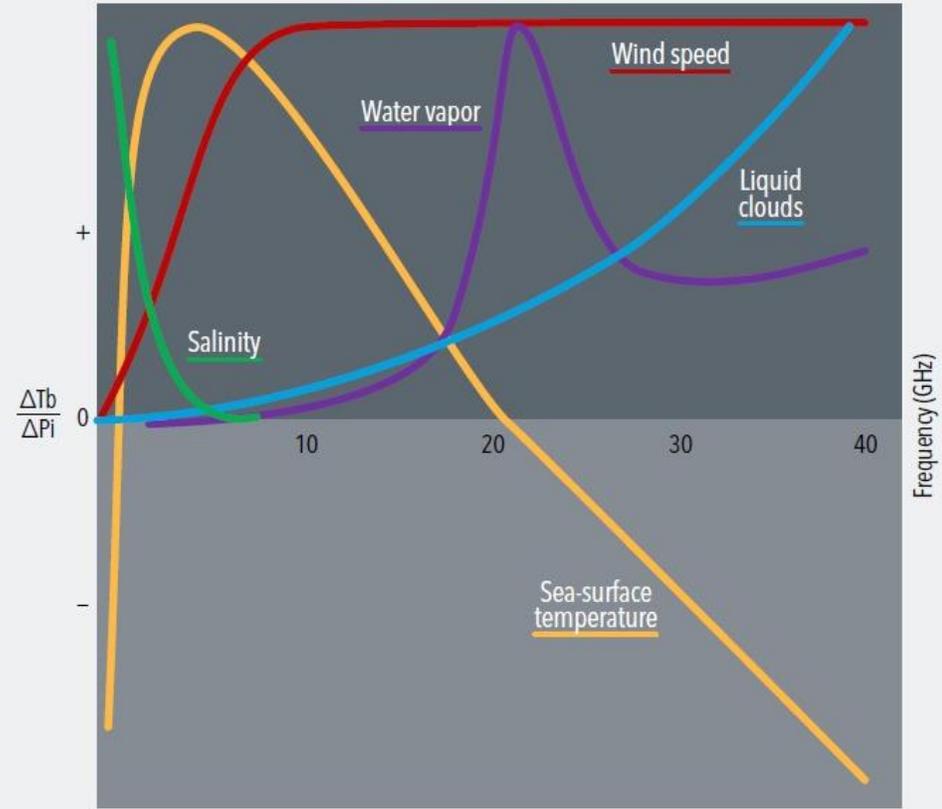
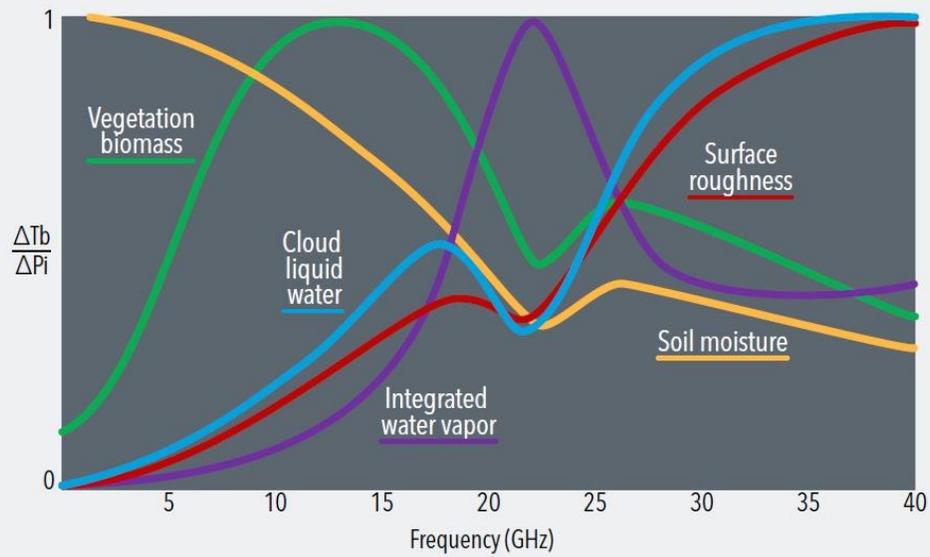
Frequency-bands are naturally defined by the laws of physics



NOT negotiable!



Natural unique resources to preserve for sake of the future generations



Source: <https://www.itu.int/hub/2021/01/the-value-of-space-based-remote-sensing/>

# Space-borne Passive Remote Sensing (of the Earth): how it is done and regulatory framework



Technologically carried out by using radiometers

Highly sensitive receiving instruments, designed for the purpose of measuring naturally emitted radio noise

Any additional man-made noise will add to the naturally existing noise that is to be measured

Operated in the framework of the EESS(passive), as per RR No. 1.51

Primary Spectrum Allocations to EESS(passive)

Frequency-bands are:

- Shared with active services
- Purely passive bands (covered by RR No. 5.340)

Identifications, which do not preclude their use by active services (e.g. above 275 GHz, RR No. 5.565)

1400.000 - 1427.000 MHz	5.340
2690.000 - 2700.000 MHz	
10.600 - 10.680 GHz	5.340
10.680 - 10.700 GHz	
15.350 - 15.400 GHz	
18.600 - 18.800 GHz	5.340
21.200 - 21.400 GHz	
22.210 - 22.500 GHz	
23.600 - 24.000 GHz	
31.300 - 31.500 GHz	5.340
31.500 - 31.800 GHz	
36.000 - 37.000 GHz	5.340
50.200 - 50.400 GHz	
52.600 - 54.250 GHz	
54.250 - 55.780 GHz	
55.780 - 58.200 GHz	5.340
58.200 - 59.000 GHz	
59.000 - 59.300 GHz	
86.000 - 92.000 GHz	
100.000 - 102.000 GHz	5.340
109.500 - 111.800 GHz	
114.250 - 116.000 GHz	
116.000 - 120.020 GHz	5.340
120.020 - 122.250 GHz	
148.500 - 151.500 GHz	
155.500 - 158.500 GHz	
164.000 - 167.000 GHz	5.340
174.800 - 182.000 GHz	
182.000 - 185.000 GHz	5.340
185.000 - 190.000 GHz	
190.000 - 191.800 GHz	5.340
200.000 - 209.000 GHz	
226.000 - 231.500 GHz	
235.000 - 238.000 GHz	5.340
250.000 - 252.000 GHz	



## UWB

Hierarchical Access Model

Primary Users  
(EESS(passive))

Secondary Users  
(UWB)

Spectrum Underlay

operating below the noise floor of primary users  
(UWB)

Compatible with EESS(passive) bands shared with active services

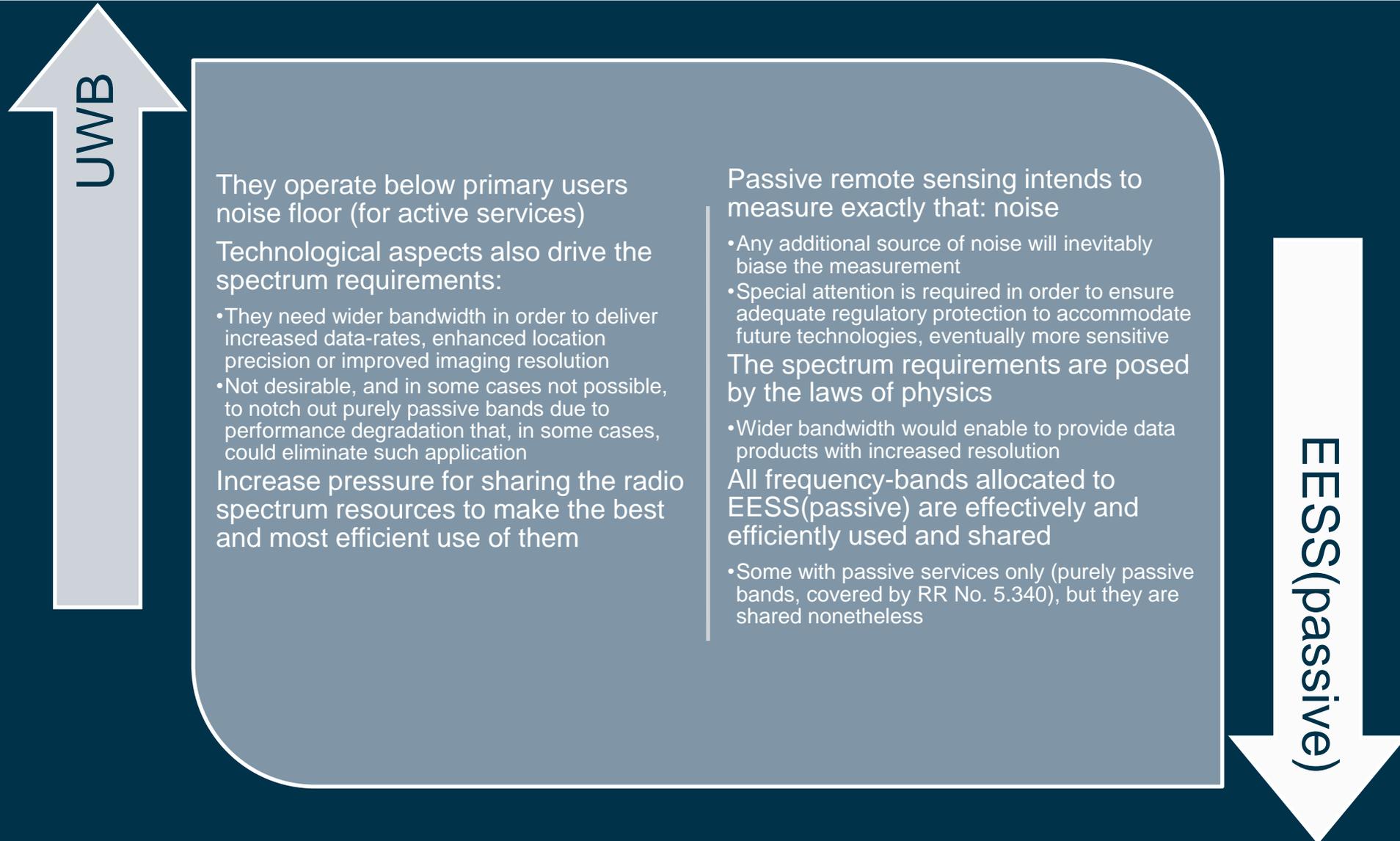
NOT compatible with purely passive bands (covered by RR No. 5.340)

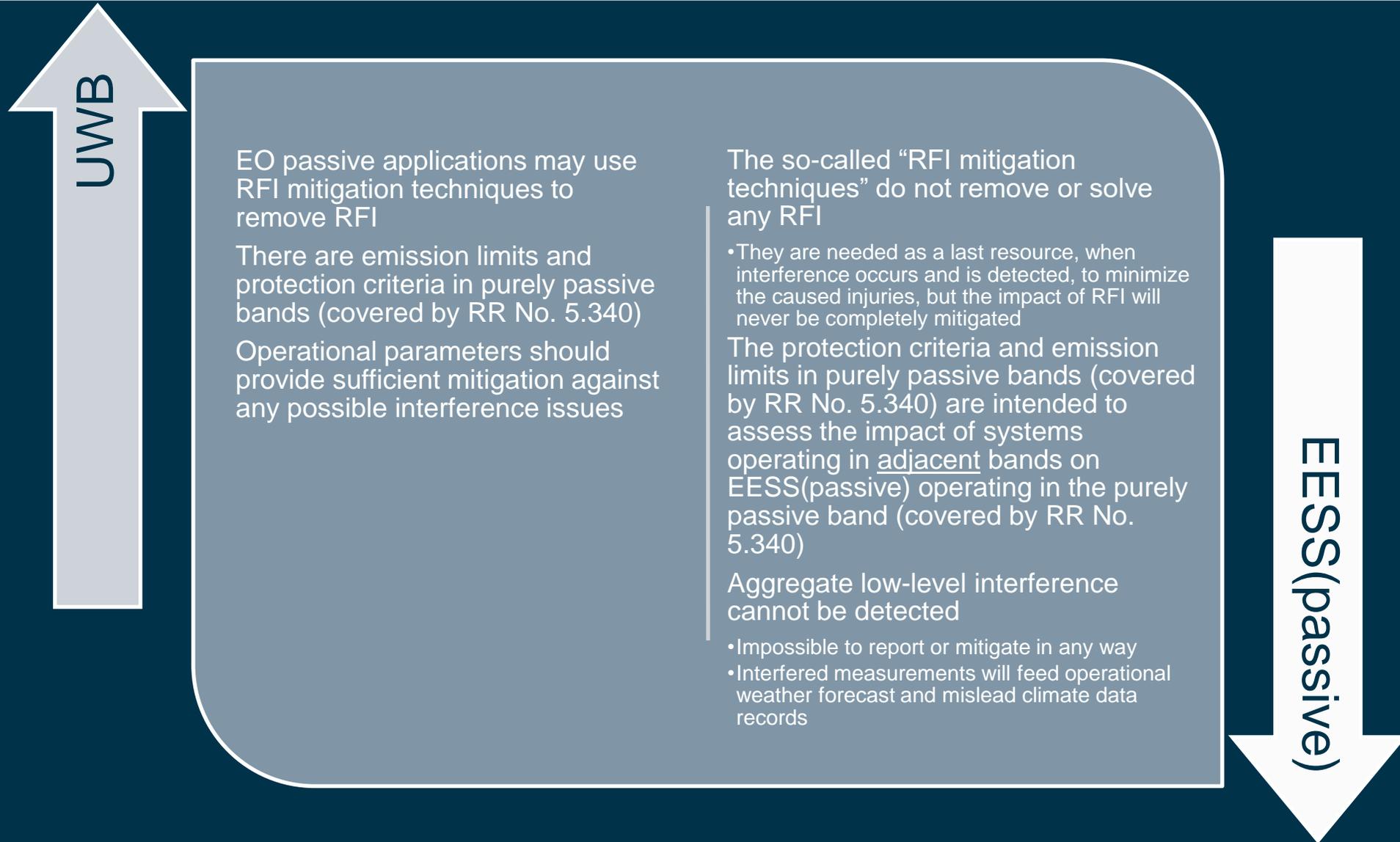
But introduced on a brute-force approach

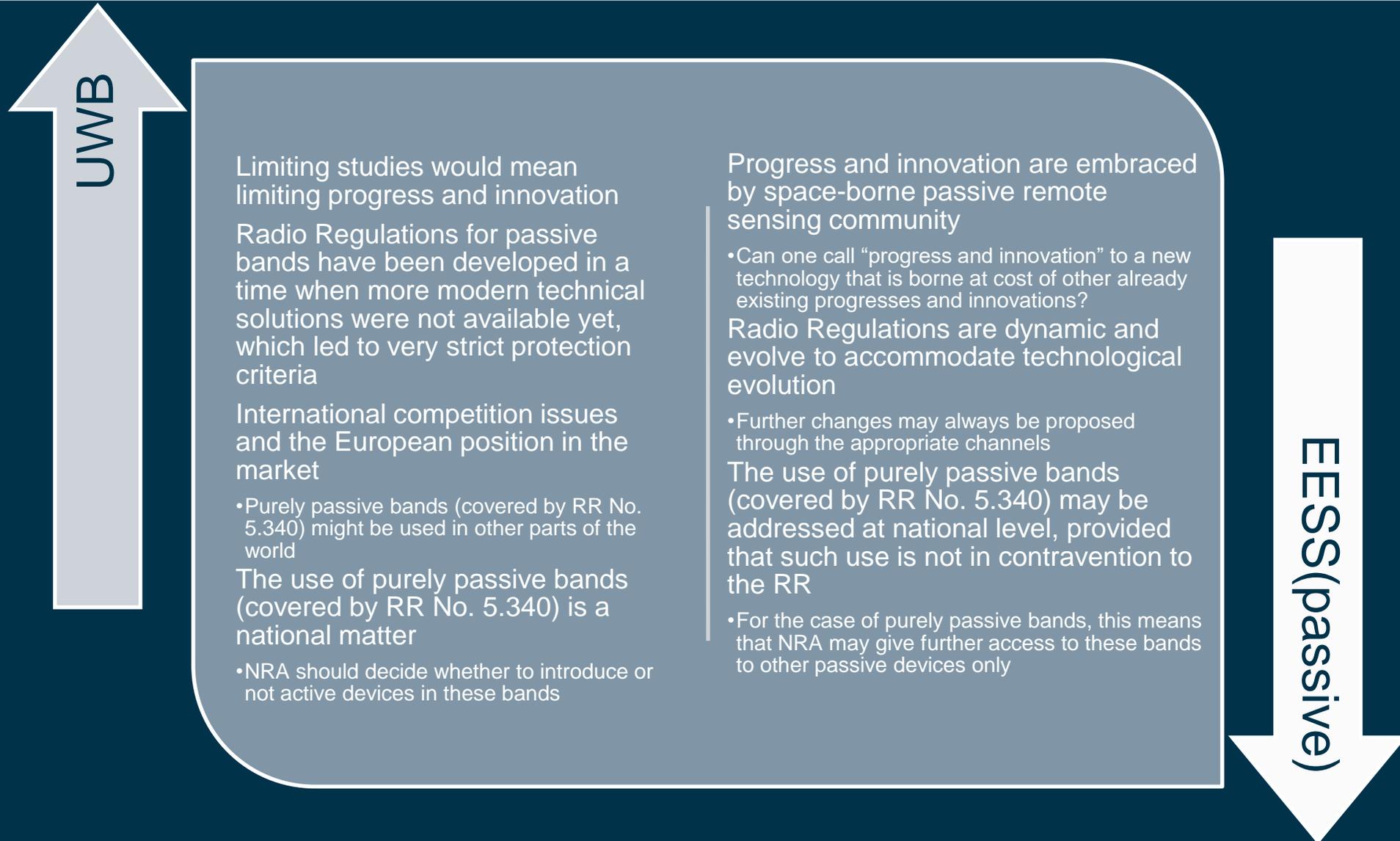
The raise within the CEPT in the number of requests for using spectrum allocated to space-borne passive remote sensors in the past years has **increased the regulatory pressure for enabling access to protected bands**

e.g.:

- UWB radiodetermination applications in the frequency range 116-260 GHz
- Low frequency microwave security scanners in the frequency range 3.6-12.4 GHz







There is an increased regulatory pressure for enabling access to purely passive bands

Definition of possible criteria, if any, under which UWB could operate on an exceptional basis in bands where all emissions are prohibited - question currently under study at the CEPT

Study how passive services could improve its communication strategy and content so to promote a better understanding of its nature and of its particular requirements

Science services tend to have plenty to lose, with limited opportunities for winning access to new spectrum resources to address observation requirements, e.g. WRC-23 AI 1.14

Thank you!

