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INTERNATIONAL CIVIL AVIATION ORGANIZATION

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ICAO WRC-27 Preparatory Workshop
Agenda item 1.7, 1.19, and Radar Altimeters

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Workshop on ITU World Radiocommunication Conference 2027
(WRC-27 Workshop)
(Bangkok, Thailand, 24-25 February 2025)

Presentation Overview

01 **Agenda Item 1.7**

02 **Agenda Item 1.19**

03 **Radar Altimeters Global Update**

04 **Summary**

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Agenda Item 1.7

ITU-R Title Text

“to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands, in accordance with Resolution **256 (WRC-23)**;”

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Res 256 (WRC-23) Requirements

- Based on sharing and compatibility studies, to identify additional spectrum for international mobile telecommunications (IMT) in one or more of the following frequency bands:
  - 4 400 – 4 800 MHz (in Region 1 and Region 3)
  - 7 125 – 8 400 MHz (in Region 2 and Region 3)
  - 7 125-7 250 MHz and 7 750-8 400 MHz (in Region 1)
  - 14.8-15.35 GHz
- Those studies need to ensure the protection of services to which the frequency band is allocated on a primary basis:
  - including protection of stations operating in international waters or airspace which cannot be registered in the MIFR,
  - without imposing additional regulatory or technical constraints on those services, and on services in adjacent bands.

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ICAO Concerns

- The adjacent frequency band 4.2 – 4.4 GHz is allocated globally to:
  - Radar altimeters aeronautical radionavigation service (ARNS) on a primary basis
  - wireless avionics intra-communication (WAIC) in the aeronautical mobile (route) service (AM(R)S) on a primary basis*
- ICAO is particularly concerned about the potential impacts of IMT identification in the band adjacent to the aeronautical systems in the 4.2 – 4.4 GHz frequency band
  - Ongoing issues raised by the ICAO State Letter SL 21/22 and the ICAO Assembly Resolution 41-7
- The radio frequency band 15.4–15.7 GHz is allocated to the primary aeronautical radionavigation service
  - Used for ground-based primary surveillance radar systems including precision approach radar (PAR) and airport surveillance surface detection equipment (ASDE).
  - Also identified by ICAO for use on board weather radar, ground mapping radar and detect and avoid (DAA) for RPAS

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Additional Considerations

- Majority of existing studies on the radar altimeter have been for 5G below 4.2 GHz
  - Limited altimeter data available for performance above 4.4 GHz
  - What performance that has been seen is not symmetrical to below the band
- New altimeters are not going to be available until 2030+
  - Studies need to be conducted on currently fielded models
  - US filter modification not tuned to above 4.4 GHz
- Additional interference concerns are also being investigated

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Current Status

- Technical details deadline has been extended until 1 Jul 2025
  - WP5B should be providing specifications for WP5D to study them
- ICAO has provided both technical and operational parameters of 4200-4400 MHz systems
  - Proposed use of exiting ITU-R recommendation (Recommendation ITU-R M.2059) and a Minimum Separation Distance (MSD) for operational scenarios
  - ICAO still need to clarify WAIC technical characteristics
  - ICAO material have not yet been adopted by WP5D and they are asking WP5B to verify
- Low attendance/support in ITU-R meetings from aviation experts
  - Has contributed to ICAO provided information from not being included in current ITU-R work

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ICAO Position

To oppose any new identification for IMT in the frequency band 4 400-4 800 MHz that reduces the protection of, or imposes additional regulatory or technical constraints, on radio altimeters and Wireless Avionics Intra-Communications operating in the frequency band 4 200-4 400 MHz.

To ensure the results of this agenda item would not reduce the protection of, or impose additional regulatory or technical constraints, on ground-based air traffic surveillance systems, airborne weather radar, and DAA radars, operating in the frequency band 15.4-15.7 GHz.

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Agenda item title

to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz, in accordance with Resolution 674 (WRC-23)

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Requirements for agenda item

- To study and consider a new primary allocation in all Regions to the Earth exploration satellite service (EESS) (passive) in the frequency bands 4200-4400 MHz and 8400-8500 MHz
    - Upgrade of existing secondary allocation used for sea surface temperature measurements
- Primary allocation would not give protection from existing services in these frequency bands and in adjacent bands.

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Aviation systems potentially affected

- The frequency band 4 200 – 4 400 MHz is allocated globally to both:
  - Radar altimeters aeronautical radionavigation service (ARNS) on a primary basis
  - wireless avionics intra-communication (WAIC) in the aeronautical mobile (route) service (AM(R)S)*

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Additional considerations

- ICAO recognizes the benefits for weather forecasting that are provided by sea surface temperature measurements.
    - Such information allows better predictions for hurricanes and other weather patterns that civil aviation uses for safe and efficient flight
    - ….but any benefits to aviation do not outweigh risks of existing aviation systems being affected by potential changes in this agenda item
- Aviation has previously been asked if altimeters can be turned off at altitude to mitigate interference environment
    - Major airframers have been very clear that this is not an option (see FSMP WG/19)

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Current Status

- Studied being conducted in WP7C
  - WP5B has sent WP7C the technical characteristics of RA and WAIC
  - 7C studies are currently only a framework without specific details

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ICAO position

To ensure any changes would not impose any technical, regulatory, or operational constraints, on radio altimeters or wireless avionics intra-communications systems in the frequency band 4 200-4 400 MHz, while recognizing the benefit for civil aviation by providing sea surface temperature measurements for weather forecasting.

Radar Altimeters

Update on global altimeter issues

- The RA interference problems with adjacent band 5G
- New altimeter standards
- Examples of current national 5G mitigations

Radar Altimeters

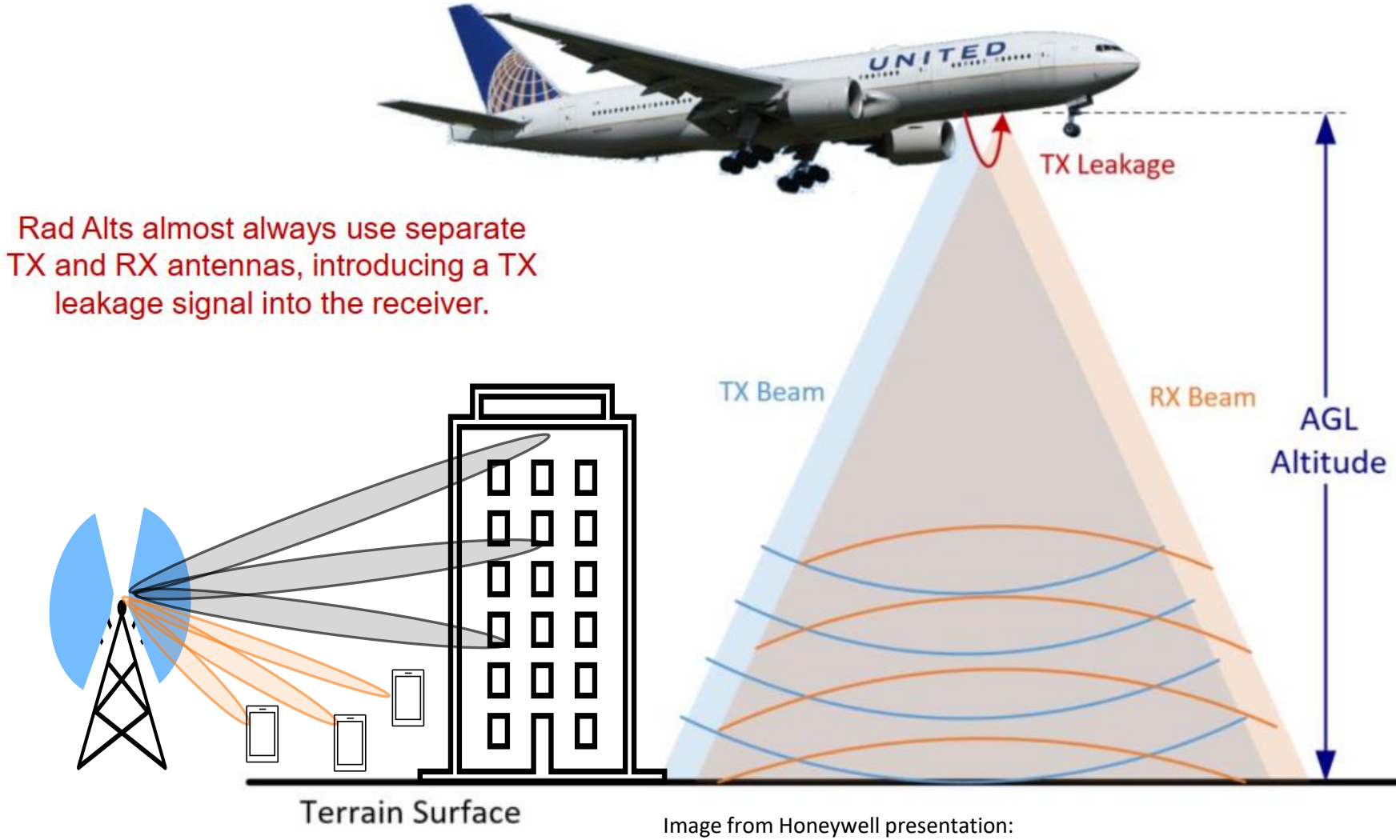
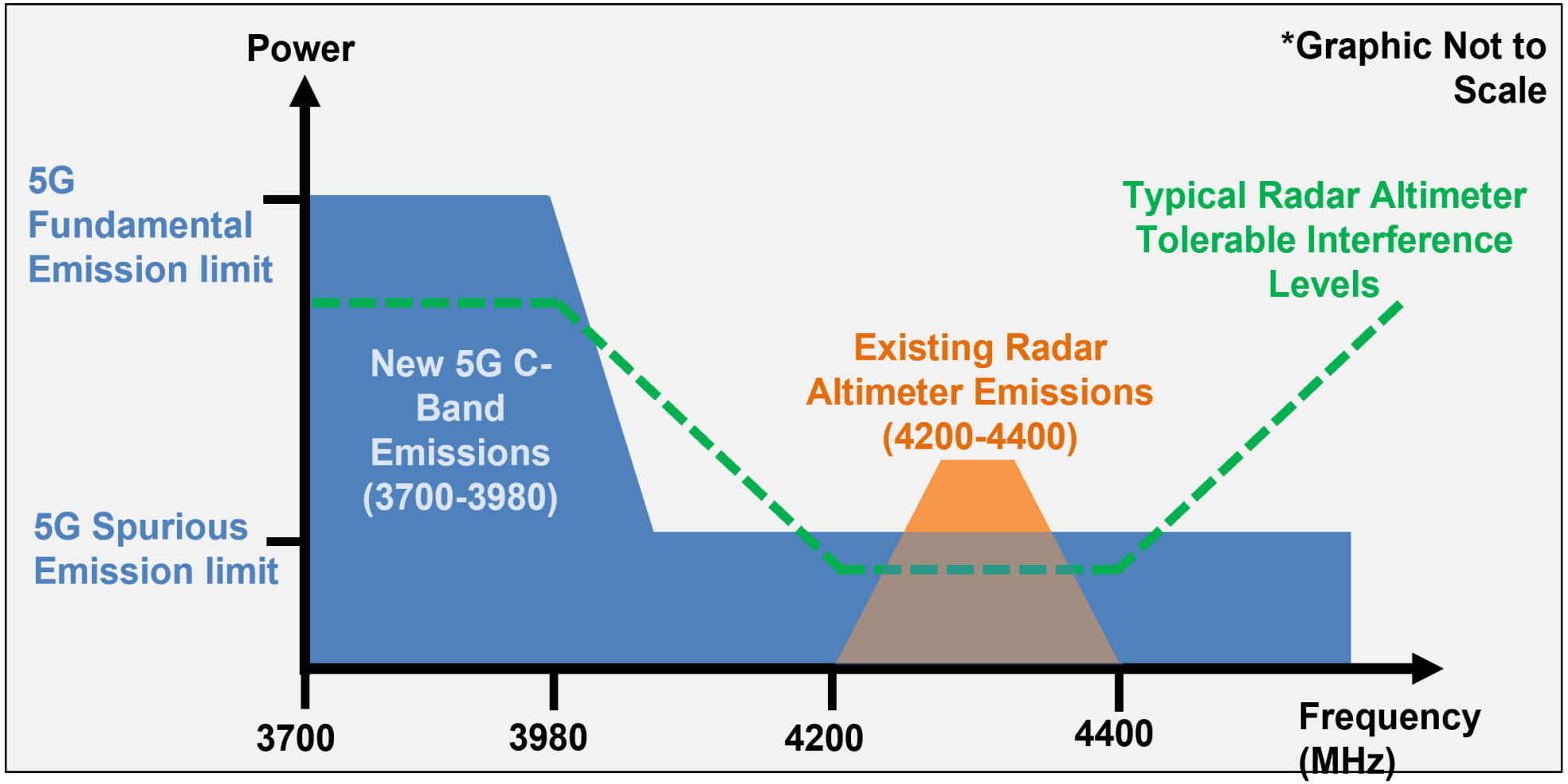


Image from Honeywell presentation:
https://avsi.aero/wp-content/uploads/2021/12/Radar-Altimeter-Overview-of-Design-and-Performance.pdf

Radar Altimeters

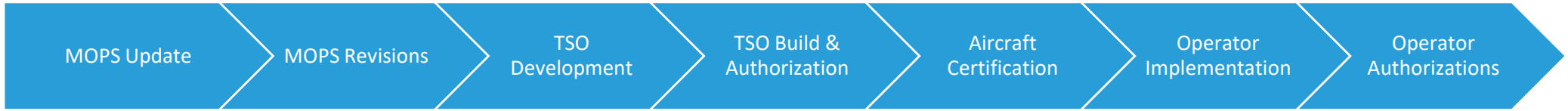
Interference concerns



Radar Altimeters

New Altimeter Standards

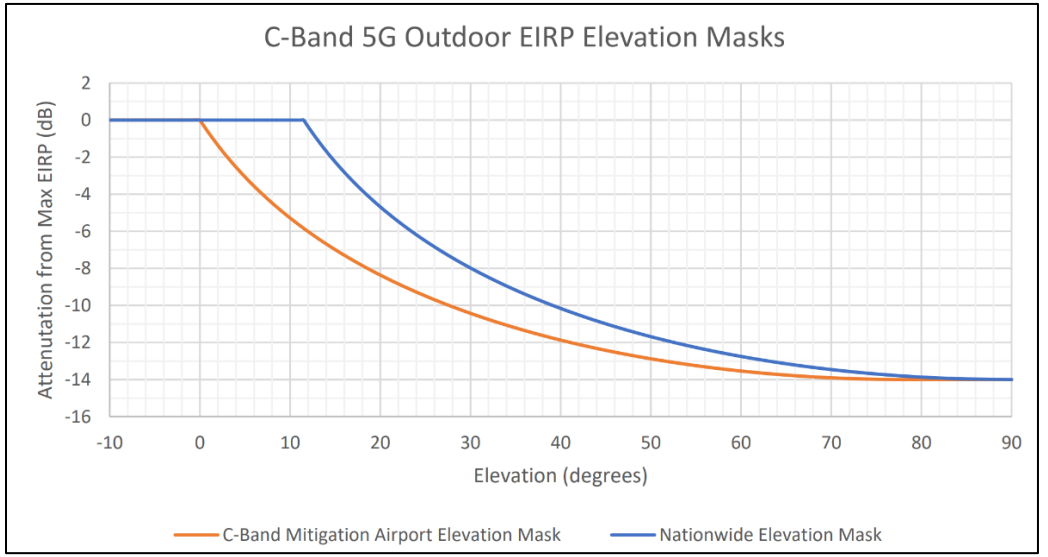
- RTCA and EUROCAE work ongoing to develop new standard
  - Aiming to provide best possible isolation of external signals while maintaining current operational performance
  - Publication should not exceed March 2027
- Certification and manufacturing of new altimeters will begin once MOPS complete
  - Will be multiple years before new altimeters are mainstream in global aircraft
  - Regular standards process normally takes 10+ years from beginning to end

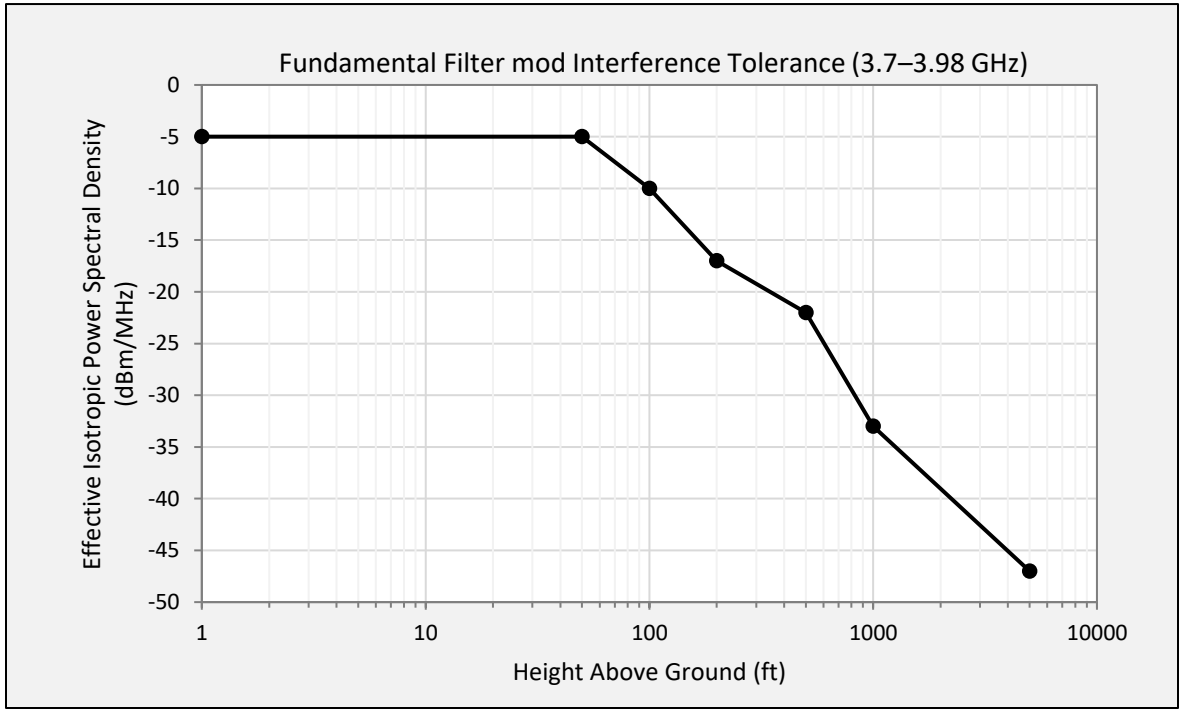


Radar Altimeters

USA 5G Mitigations Example

- 5G antenna elevation limited above horizon
- Limit 5G spurious emissions to -48 dBm/MHz in 4.2-4.4 GHz
- Rolling update of altimeter filters for 3.7-3.98 GHz by Feb 2024
- 5G mitigations agreed until 1 Jan 2028
- More details here: https://www.faa.gov/5g

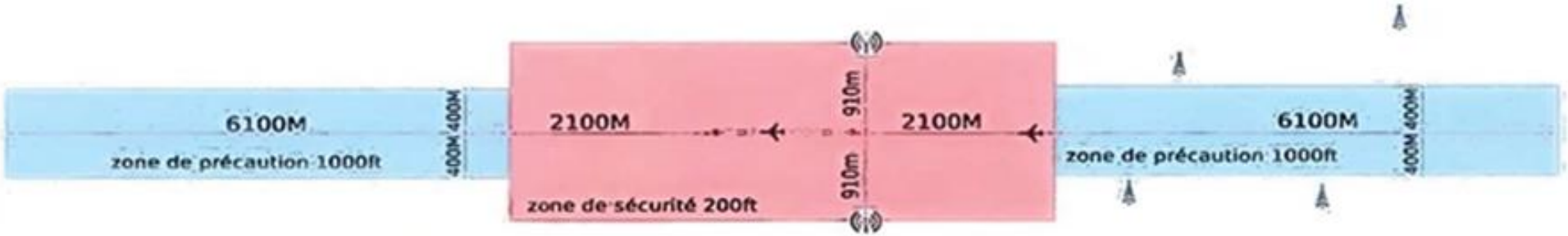




Radar Altimeters

France 5G Mitigations Example

- Provisional precautionary measures relating to the geographical location of some 5G antennas in the vicinity of airports with IFR procedures in mainland France have been implemented.
  - Mitigation measures are still in place around Airports where ILS CAT III are implemented



Radar Altimeters

Ongoing Actions

- Aviation industry needs to engage with national and international spectrum regulators
  - Advocate for ICAO position and provided data
- Ideal engagement is increased aviation attendance at the ITU-R WP5B and WP5D
  - Allow greater ‘in-room experience’ from aviation and additional voices to support ICAO position
- Additional engagement at national level is strongly encouraged as a minimum
  - Participate in national spectrum regulator process to educate and inform on aviation specific requirements
- Please contact ICAO Secretariat if there are any questions or national updates
  - Can provide additional resources and help document ongoing national efforts
  - Updates to CG summary paper are welcome
    - See latest paper here: https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG18/IP%20-%20Copy/FSMP-WG18-IP09R1_CG-RA%20Report%20Feb%202024%20v1.2.docx

Radar Altimeters

Summary

- New radar altimeter standards are going to take time to be implemented
  - Near-term studies of 5G/6G needs to assess current altimeter equipment
- Aviation industry needs to engage with spectrum regulators to provide aviation specific expertise and guidance
  - Both at domestic and international processes
  - Promote correct usage of altimeter performance, ICAO operational scenarios, and protection of WAIC
- Please contact ICAO Secretariat for questions and provide updates to FSMP
  - Can provide additional resources and contacts for questions

Thank You

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