

Implementation of  
**WRC-15**  
for Space Services

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Hon Fai Ng

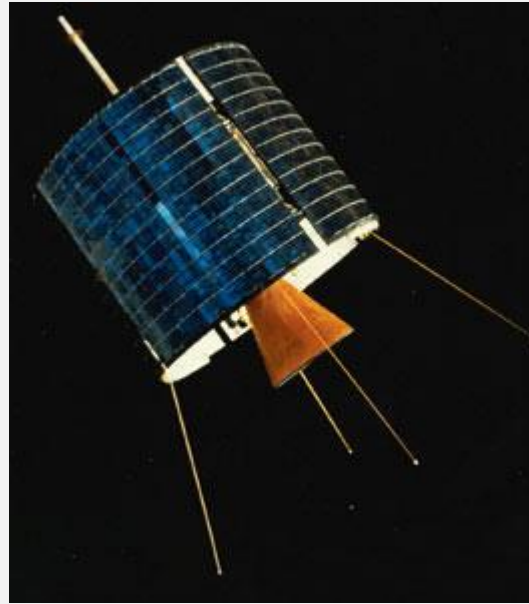
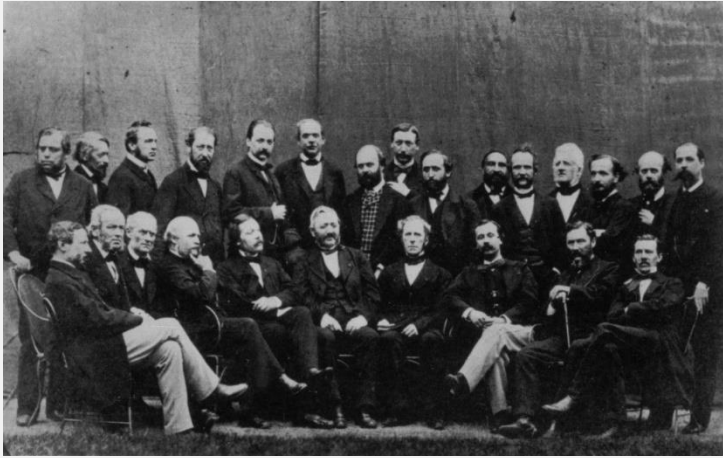
Space Services Department

ng@itu.int



**150 years**

1865 International Telegraph Union



**25 years**

1990 Hubble Space Telescope was deployed



**2015**

**50 years**

1965 1st commercial communications satellite in GSO, Intelsat 1



WRC-15

ITU Secretary General,  
Houlin Zhao





# World Radiocommunication Conference

Review or revise international treaty on radio-frequency spectrum and orbits

Harmonise global spectrum  
Create regulatory certainty (consensus)  
Maintain sustainable ecosystem



# Space Industry in 2015

\$ 335.3  
billion

(IDR 4,430,000,000,000,000)

Source: SSIR 2016 Tauri Group

# Global Impact and Usage



Satellite Radio



Corporate networks



Maritime communication



Earth Observation



National Security & Defense



E-learning



Agriculture



Cellular Backhaul



Telemedicine



Aviation Security



SNG



VSAT



Internet



Disaster Relief



Global Flight Tracking



DTH



Satnav





Consensus took 500 meetings  
692 hours or "86.5 working days"

## WRC-15 in numbers

2 - 27 Nov 2015 in Geneva

3275 participants

162 Member states

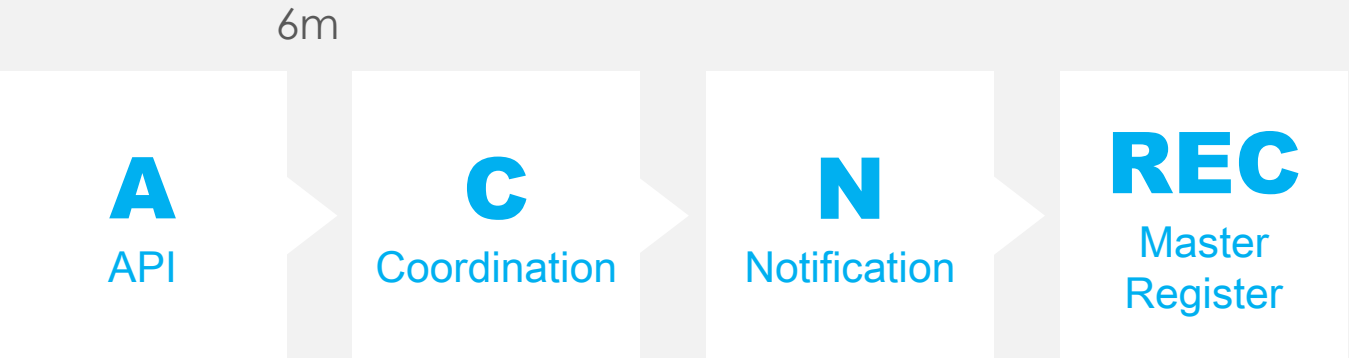
40 topics

678 documents with 2888 proposals

Final Acts [www.itu.int/pub/R-ACT-WRC.12-2015](http://www.itu.int/pub/R-ACT-WRC.12-2015)

What are the regulatory changes to space services following WRC-15?

# Before WRC-15

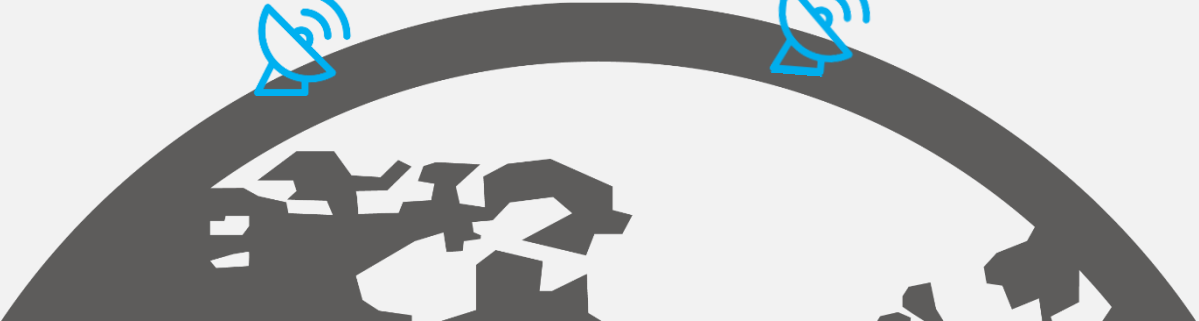


Right to international recognition, taken into account to avoid harmful interference (No. 8.3)

Interference free

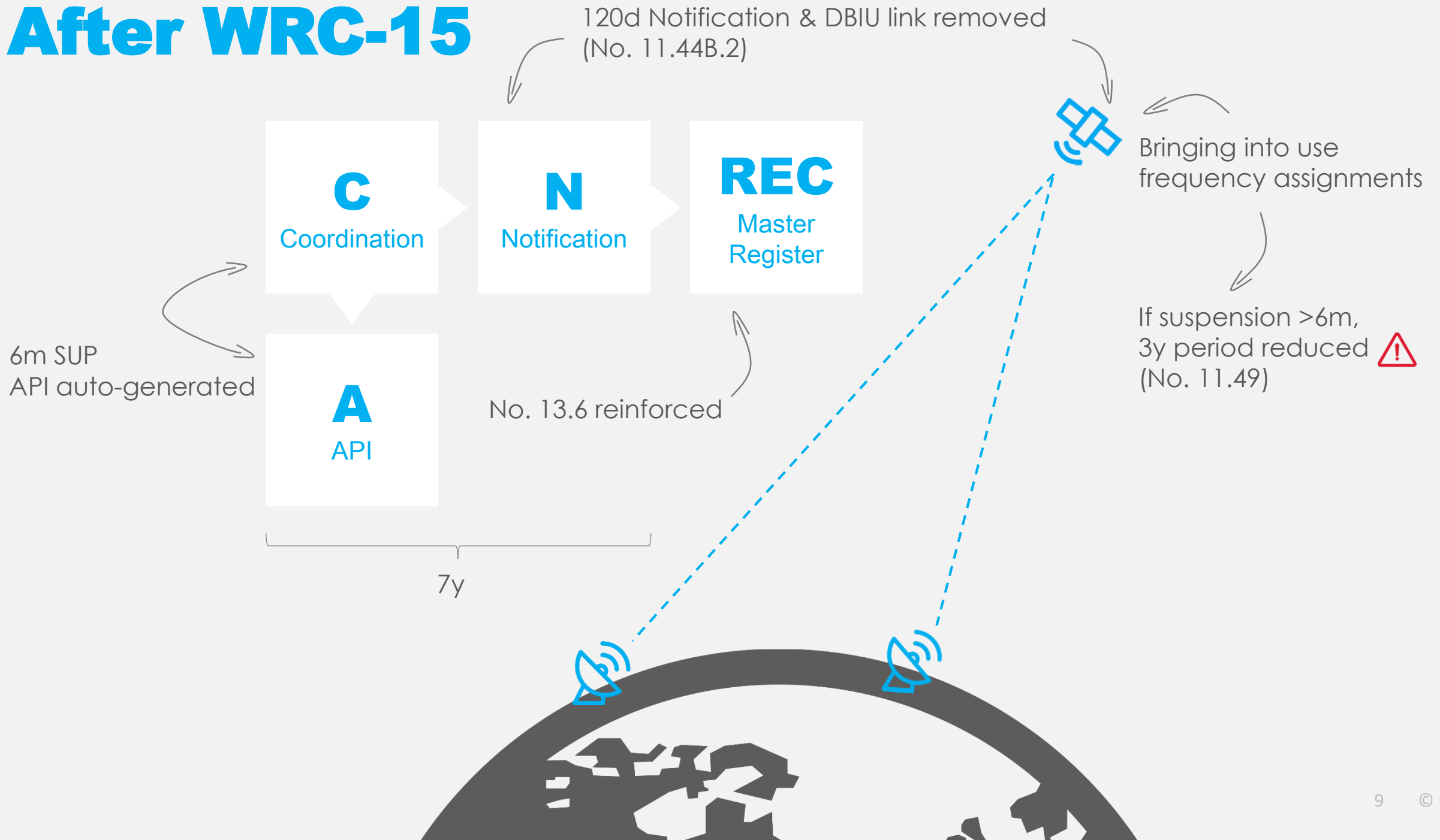


Bringing into use frequency assignments





# After WRC-15



# After WRC-15

**C**

Coordination

**N**

Notification

**REC**

Master  
Register



**A**

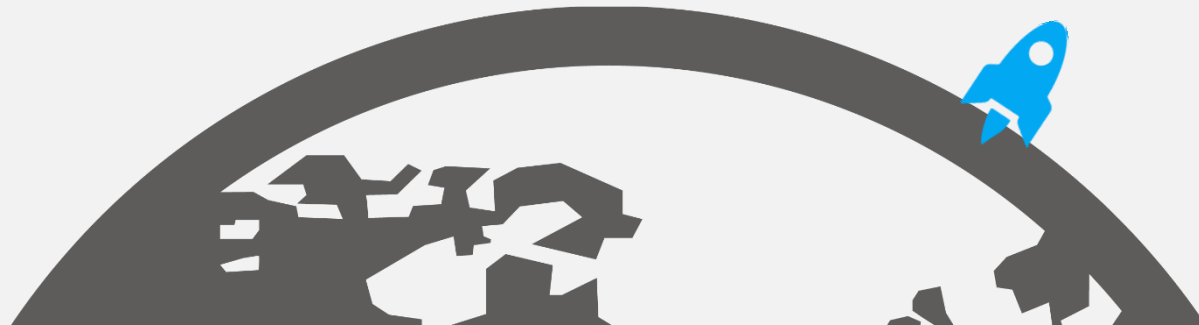
API

## Satellite launch failure

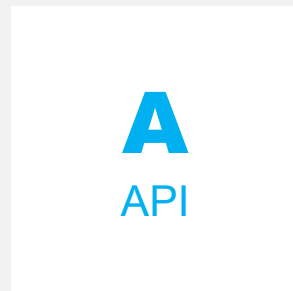
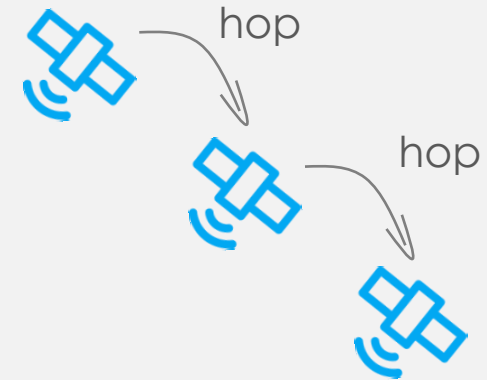
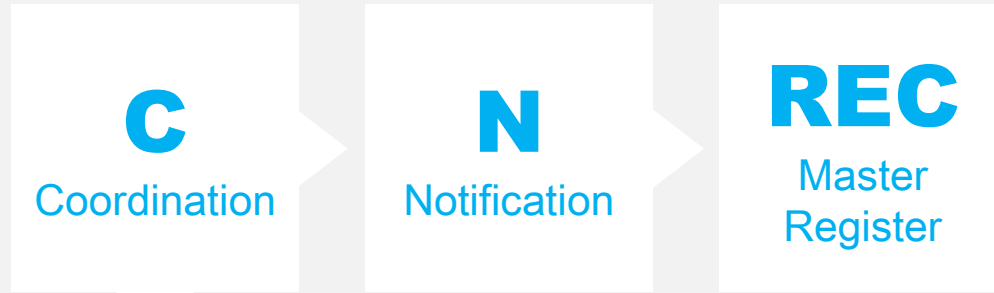
WRC-15 confirms decision of WRC-12  
RRB to address co-passenger delay or *force majeure*  
Case-by-case basis  
Extension to be “limited and qualified”

**BOOM..!**

Source: CR/389 of 29.01.2016



# After WRC-15



## Bring Into Use (BIU) at multiple locations

WRC-15 adopted Res 40 (WRC-15)

For BIU or BBIU, Adms to inform if using existing satellite (< 3 years)

From 1 Jan 2018, if not provided, considered not BIU or BBIU 

### BR

Prepared submission form

[www.itu.int/net/ITU-R/space/snl/sat\\_relocation/RES40\\_Form.pdf](http://www.itu.int/net/ITU-R/space/snl/sat_relocation/RES40_Form.pdf)

Developed webpage to publish information

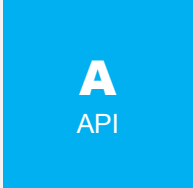
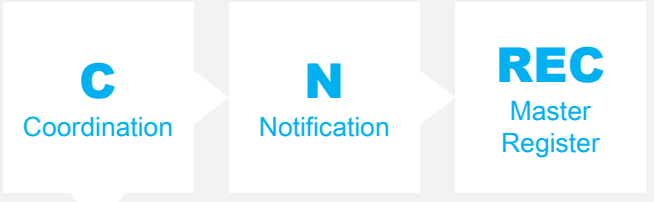
[www.itu.int/net/ITU-R/space/snl/sat\\_relocation/index.asp](http://www.itu.int/net/ITU-R/space/snl/sat_relocation/index.asp)

Source: CR/396 of 31.03.2016, CR/403 of 05.07.2016





Let's look in more detail



# No more API submissions

(subject to coordination)

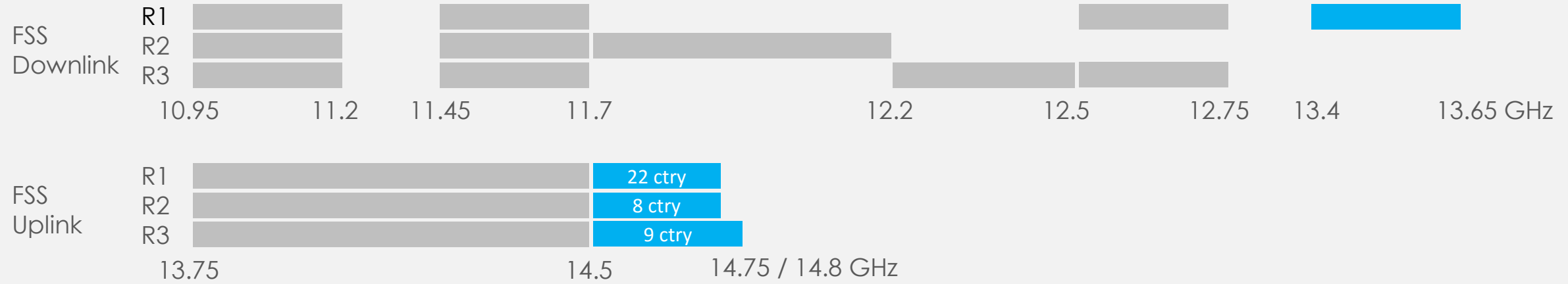


## BR

To publish API basic characteristics based on CR  
Developing secure electronic submission system

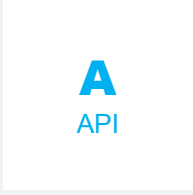
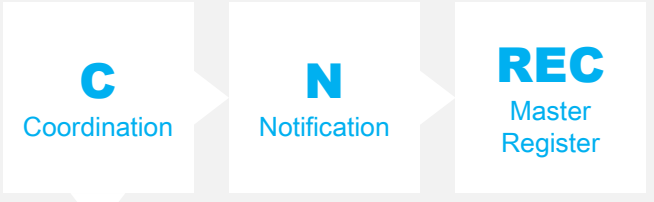
Source: CR/401 of 19.05.2016, Res 31 (WRC-15), Res 908 (Rev.WRC-15)

# New Frequency Allocation



- FSS 13.4-13.65 GHz
- FSS (non-FL BSS) 14.5-14.8 GHz
- Maritime-Mobile Satellite Service 7375–7750 MHz
- Earth-Exploration Satellite Service 7190-7250 MHz
- Earth-Exploration Satellite Service (active) 9.2-9.3, 9.9-10, 10.-10.4GHz

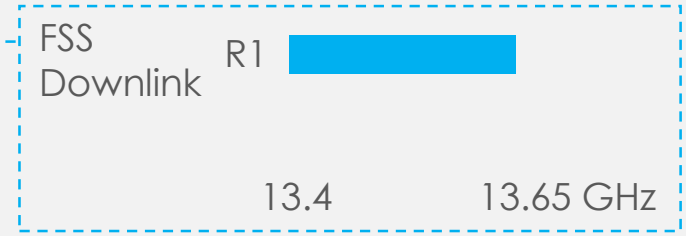
Source: CR/402 of 14.06.2016, RoP RRB16/72, CR/403 of 05.07.2016, Res 163 & 164 (WRC-15)

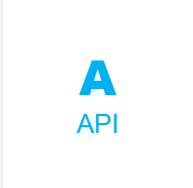
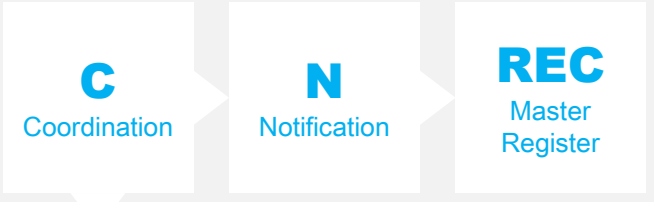


# New Frequency Allocation

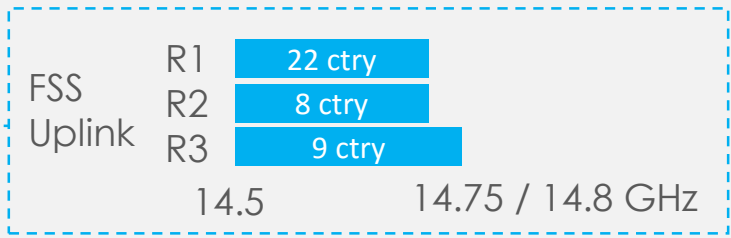
## Conditions

1. Limited to GSO (5.499A)
2. Meet PFD limits (Table 21-4)
3. Coordinate under No. 9.7
4. Not claim protection from EESS (5.499E)
5. Seek agreement under No. 9.21 with SR (5.499A)





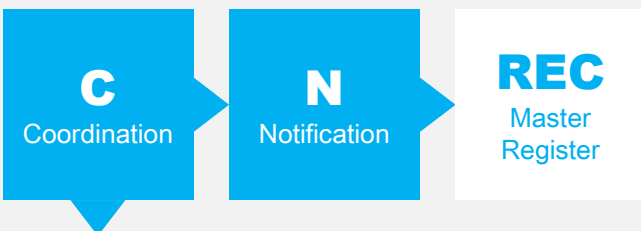
# New Frequency Allocation



## Conditions

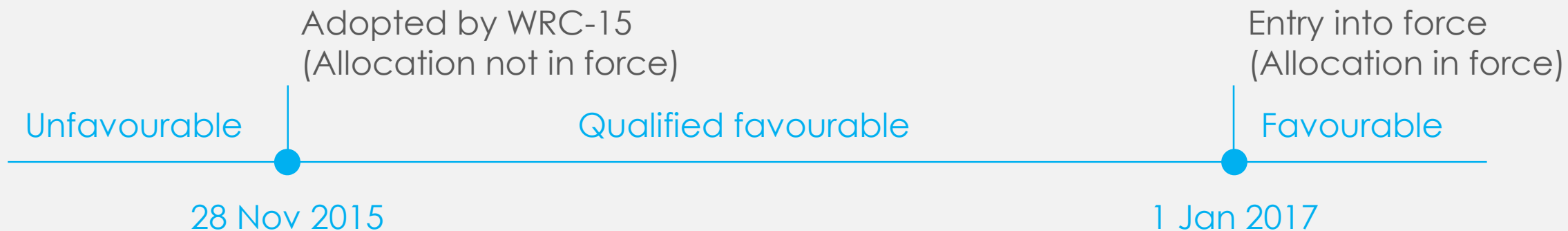
1. Limited to GSO (No. 5.509B)
2. Commit (A16c of Ap4) to meet 500 km from other countries (No. 5.509E)
3. Commit to meet PFD limits at certain altitude & distance (No. 5.509D)
4. Provide antenna diameter (C.10.d.7 of Ap4)
5. Meet minimum 6m antenna diameter & max PSD (No. 5.509C)
6. Meet PFD limits at GSO (No. 22.40)
7. Coordinate under No. 9.7 & Ap30A#7.1
8. For R3, limited to AUS, CBG, CHN, J, LAO, PAK, PNG, THA, VTN





**A**  
API

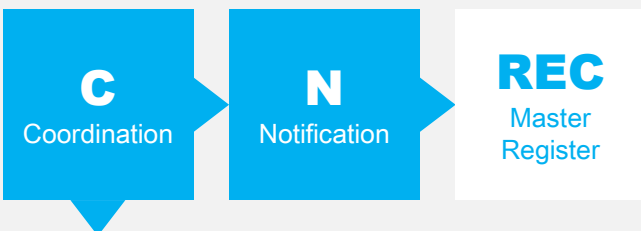
# Date of entry in force



## RRB

Developed Rules of Procedures “Effective date of entry into force”

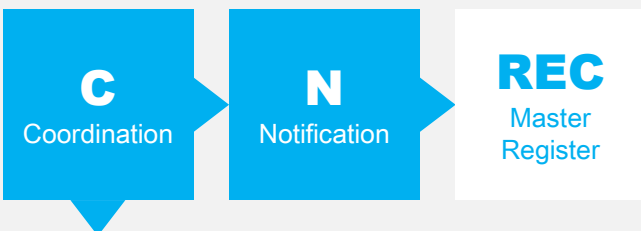
Source: CR/402 of 14.06.2016, RoP RRB16/72



**A**  
API

# Date of entry in force





**A**  
API

# Update database & software

New frequency allocation  
(BR Soft)

Separation of affected networks  
(same or opposite direction of  
transmission) (GIBC/AP8)

Detailed provision of No. 11.41/9.7  
etc. (SRS)

Update of No. 11.41 following SUP  
of existing networks  
(NOTEX system)  
[www.itu.int/net4/ITU-R/space/noq/](http://www.itu.int/net4/ITU-R/space/noq/)



Reduction in coordination arc for  
C (7 deg) and Ku-band (6 deg)  
(GIBC/AP8)

Calculation of PFD outside of  
coordination arc for C (uplink only)  
and Ku-band (Probability of harmful  
interference under No. 11.32A)

Source: Appendix 5 (Rev.WRC-15), Resolution 762 (WRC-15), CR/397 of 08.04.2016

**C**  
Coordination

**N**  
Notification

**REC**  
Master  
Register

**A**  
API

# Request for clarification (No. 13.6)

Are notified/recorded assignments in use or continuous use?

## BR

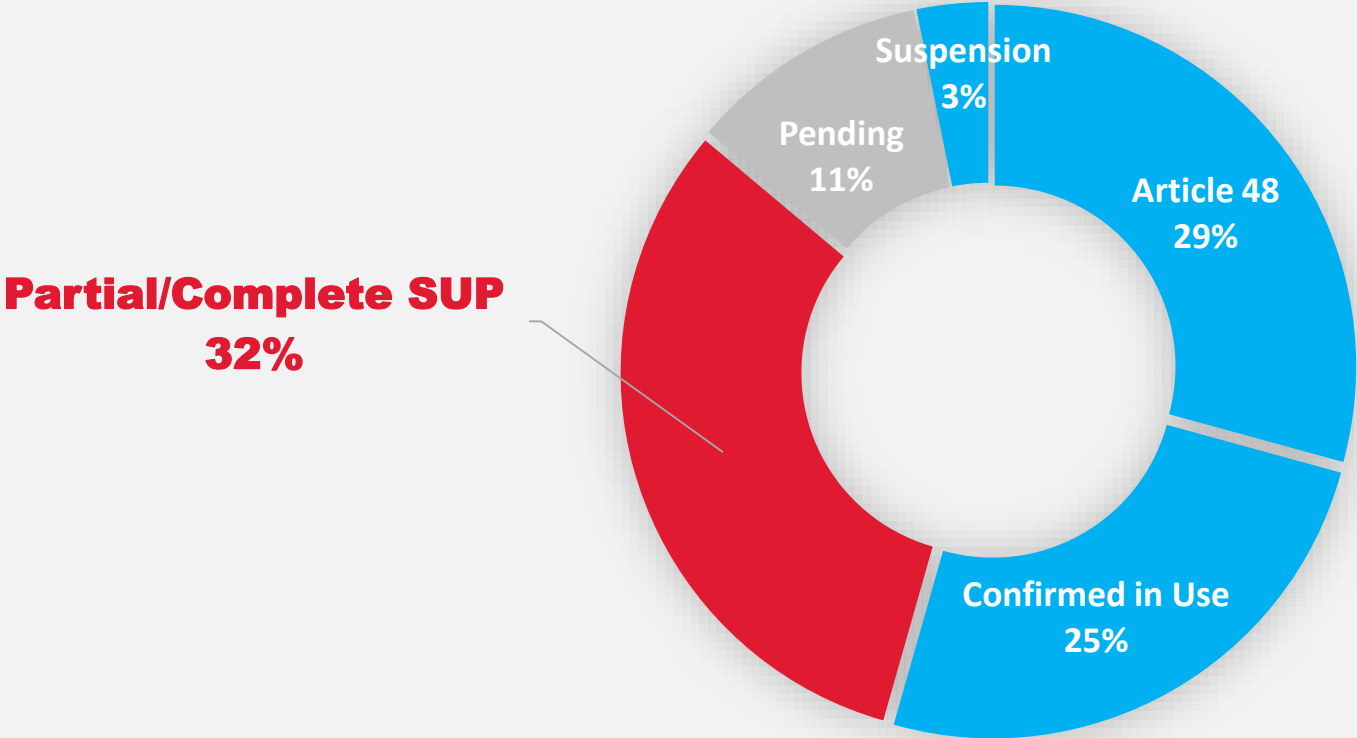
To provide reason

To provide conclusion within 3m

- ⚠ To request additional / alternative info, if Adms provide partial evidence
- To only accept direct reference to Art. 48 of Constitution (military radio installations)

Source: CR/389 of 29.01.2016, RR No. 13.6, CCRR/57 Draft RoP

# Current Status of No. 13.6 Clarification



Source: ITU 2016

How about issues related to earth stations?



## Typical FSS ES

Notification of typical earth stations (ES) in fixed-satellite service (FSS) for possible international recognition

### WRC-15 concluded

ITU-R studies before regulatory decision  
Administration can submit typical ES, for information  
BR to prepare a common format

### BR

Developed web platform for submission  
<https://www.itu.int/net4/ITU-R/space/TypicalESinFSS/>  
To publish information received

Source: CR/389 of 29.01.2016, CR/404 23.05.2016





## WRC-15 adopted Resolution 156 (WRC-15)

Not claim protection & not cause interference to primary Fixed/Mobile in 5.524 countries (§1.2)

Commit to cease / reduce interference to 2ndary fixed/mobile in 5.542 countries (§1.4, 1.5)

Not for safety of life applications (§1.7)

Network Control & Monitoring Centre to disable (§1.6)

Employ tracking techniques to associated GSO FSS (§2)

## BR



Introduced new class of station for FSS, **UF**, for ESIM as of 28 Nov 2015

To discontinue previous symbol, UC, from 1 Jan 2017 (No. 5.526)

To request for commitment to cease harmful interference (§1.5)

## Earth Station In Motion (ESIM)

ESIM communicating with GSO FSS in 19.7-20.2 GHz and 29.5-30.0 GHz (No. 5.527A)



Source: CR/393 of 18.03.2016, CR/403 of 05.07.2016, No. 5.527A, Res 156 (WRC-15), Draft RoP CCRR/57





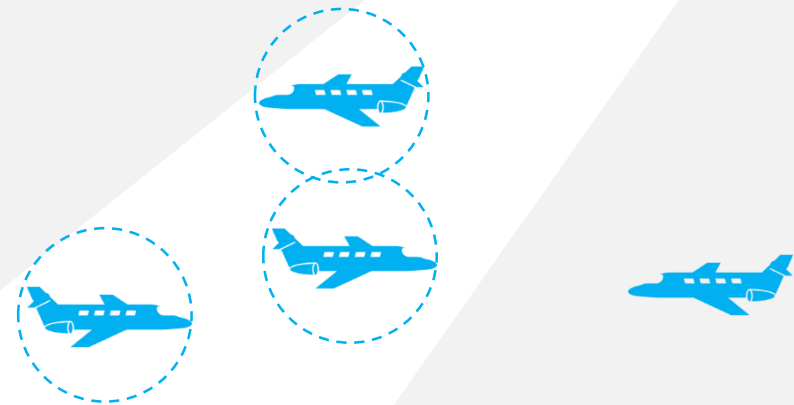
# Global Flight Tracking

WRC-15 allocated 1 087.7-1 092.3 MHz to Aeronautical Mobile-Satellite Service (Route)(AMS(R)S) for Automatic Dependent Surveillance-Broadcast (ADS-B)

## BR

Introduced new classes of station, **E5/T5 & E6/T6**, for AMS(R)S & (OR), respectively  
To update SRS database with new symbols

Source: CR/394 of 18.03.2016, CR/403 of 05.07.2016, Res 425 (WRC-15), 5.328AA





## WRC-15 adopted Resolution 155 (WRC-15)

GSO FSS satellites in Ku and Ka-bands (§1)

Not cause more interference/constraints to others (§6,8,14)

To withstand interference from others (§11,12)

Ensure safety of flight of UAS, use favourable recorded assignments (§13)

Used after adoption of ICAO SARPs (§3)

## BR

Introduced new classes of station, **UG**, for ES on UA

To post on web “as-received” UAS submissions, for info & assist ITU-R studies [www.itu.int/net4/ITU-R/space/UAS-submissions](http://www.itu.int/net4/ITU-R/space/UAS-submissions)

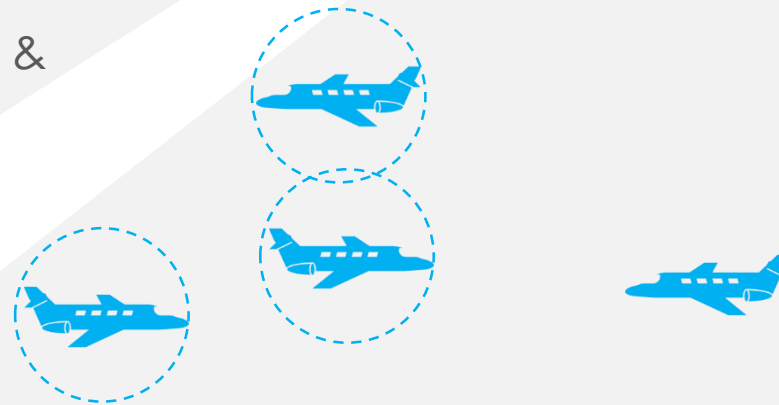
Not to process submissions until Res 155 implemented

To present progress report in next WRC

Source: CR/407 of 05.07.2016, CR/389 of 29.01.2016, Resolution 155 (WRC-15)

## Unmanned Aircraft System (UAS)

Control of unmanned aircraft vehicles (“drones”) by remote pilot in non-segregated airspace





**C**  
Coordination

**N**  
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# What's next?

WRC-15 Final Acts [www.itu.int/pub/R-ACT-WRC.12-2015](http://www.itu.int/pub/R-ACT-WRC.12-2015)

Circular Letters 389 to 407 [www.itu.int/md/R00-CR-CIR](http://www.itu.int/md/R00-CR-CIR)

Draft Rules of Procedure on WRC-15 decisions [www.itu.int/md/R00-CCRR-CIR-0057](http://www.itu.int/md/R00-CCRR-CIR-0057)

BR Software updates [www.itu.int/en/ITU-R/software/Pages/space-network-software.aspx](http://www.itu.int/en/ITU-R/software/Pages/space-network-software.aspx)

**WRC-19 Preparatory Studies** [www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-19-studies.aspx](http://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-19-studies.aspx)

