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World Meteorological Organization
 Organisation météorologique mondiale
 Organización Meteorológica Mundial
 Всемирная метеорологическая организация
 المنظمة العالمية للأرصاد الجوية
 世界气象组织

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Our ref.: 8739-19/OBS/WIS/ITS/RF

Mrs Marlene Dortch, Secretary
 Federal Communications Commission (FCC)
 455 12th St., S.W.
 WASHINGTON, D.C. 20554
 USA

Received & Inspected

JUN 30 2016

FCC Mail Room

GENEVA, 21 June 2016 ~~DOCKET FILE COPY ORIGINAL~~

Subject: WMO comment in opposition to RM-11681: To update the record on Ligado's request that the FCC initiate a rulemaking to allocate the 1675-1680 MHz band for Terrestrial Mobile Use Shared With Federal Use

Dear Mrs Dortch,

The World Meteorological Organization (WMO) has noted the Public Notice seeking comment on Ligado's request that the U.S. Federal Communications Commission (FCC) initiate a rulemaking to allocate the 1675-1680 MHz Band for Terrestrial Mobile Use. WMO wishes to refer to its previous letter in this Proceeding dated 12 December 2012.

WMO is the United Nations Specialized Agency with responsibility for coordinating international activities in meteorology, climatology, operational hydrology and related geophysical sciences. WMO has responsibility for advising the sovereign states that are its Members on the potential impacts of the use of the radio spectrum on these sciences, including the impact on operational weather forecasting. WMO has been involved in the use of satellite meteorological information and dissemination since the 1960's as demonstrated by the World Weather Watch programme.

As noted in our previous correspondence, WMO recognizes the legitimate actions Ligado is taking in finding solutions to deploy its broadband network and that this is a U.S. national issue. However, WMO is extremely concerned about the potential precedence setting nature of this solution should it be implemented.

Timely warning of impending natural and environmental disasters and detailed understanding of the status of global water resources: these are all critically important everyday issues for the global community. The National Meteorological and Hydrological Services (NMHSs) around the world are responsible for providing this information, which is required for the protection of the environment, economic development (transport, energy, agriculture, etc.) and the safety of life and property.

cc: Permanent Representative of the United States of America with WMO, Silver Spring (for information)

I refer you to ITU Resolution 673 (Rev. WRC-12) and to World Meteorological Congress Resolution 29 (Cg-17), both of which highlight the importance of Earth observations and their social and economic value.

Radio frequencies are important yet scarce resources used by National Meteorological and Hydrological Services (NMHSs) to measure and collect the observation data upon which analyses and predictions, including warnings, are based or processed, and to disseminate this information to governments, policy makers, disaster management organizations, commercial interests and the general public. Meteorological satellite systems commonly collect a variety of data with visible and infrared imagers as well as with instruments for passive and active sensing using also microwave frequencies allocated to that purpose. We understand the 1675-1680 MHz frequency range under consideration is used both for raw data downlink (on current GOES satellites) and the retransmission of Data Collection Platform data (on the new generation GOES-R series satellites).

The raw data gathered by the instruments on-board a meteorological satellite are transmitted to a primary ground station of the operating agency, processed, and distributed to various NMHSs, to official archives, and to commercial users. Raw data, for example, include images of the Earth taken at several wavelengths so as to provide a variety of measurement data such as surface temperature, wind velocity, rainfall rate, river and stream height, coastal tide height, gases in the atmosphere, and, in the case of floating buoys, oceanic pollutants. The Geostationary Operational Environmental Satellites (GOES) transmit processed measurement data to a minimum of tens-of-thousand receiving stations within the combined hemispherical footprint of the GOES spacecraft. These include not only stations in countries throughout North and South America, but also locations in New Zealand, France, Spain and Great Britain. The majority of these recipients are non-Federal and Federal government agencies involved with meteorological forecasting or hydrology and universities. Others include value-added private sector partners supplying weather forecasts to commercial interests or managers of water resources. This capability cannot be easily replaced, by either terrestrial means, which is subject to failure or disruption, or by spectrum in higher bands, which is more susceptible to the very extreme precipitation events that it may be needed to warn against.

Successful weather forecasting for a country relies on the supply of observations from other countries that use these frequencies in their observing programs. It's also the case for the U.S. and setting a precedent within the U.S. that uses these frequencies for other than meteorological purposes would weaken the ability of other, less influential, nations to retain these frequencies for meteorological observing and hydrological management. The resulting loss of observations from these countries would harm the ability of all countries, including the U.S., to forecast and respond to severe weather events including those involving extreme precipitation.

Also, the risk of interference in these bands in unprotected sites is of significant concern since it is expected that regulations will include provisions that only select U.S. federal government sites will be protected, akin to the recent AWS-3 sale of spectrum. The recent evidence¹ that has emerged about interference from terrestrial wireless signals in an adjacent band that disrupted downlinks from current GOES satellites is of grave concern to WMO and NMHSs, especially in hurricane prone areas of the western hemisphere. This could be a significant factor in the Caribbean where terrestrial wireless interference from a U.S. territory like Puerto Rico could impact a vast area over hundreds of kilometers and multiple nations via its surrounding waters due to anomalous propagation such as thermal ducting.

¹ The evidence was highlighted both in a National Oceanic and Atmospheric Administration budget hearing with the U.S. House of Representatives Committee on Science, Space and Technology on 16 March 2016 by Representative James Bridenstine (<http://1.usa.gov/1YeTy6W>) and in a joint American Meteorological Society and American Geophysical Union event on this topic in the U.S. Senate on 25 May 2016 (<http://bit.ly/PaeseSpectrumAMS> on page 8).

For example, the WMO Regional Association IV (RA IV), which includes the NMHSs in North America, Central America and the Caribbean, cooperates closely on hurricane preparedness and forecasting. Both in preparation for hurricane season and in real-time during hurricane and storm surge events, the relevant NMHSs work closely together sharing data to minimize the effects of these often deadly storms. All of the NMHSs rely upon real-time U.S. GOES imagery for this forecasting, and have been informed of and planning for the new technology and innovation with the GOES-R series of satellites for nearly 15 years. Most recently, the 38th Session of the RA-IV Hurricane Committee was held 21-26 April 2016 in San Juan, Puerto Rico, which is a gathering of the most hurricane impacted countries in the region. Held annually, these collaborative sessions speak to the length and extent of this cooperation. Any degradation of or disruption to the GOES or future GOES-R data would have a significant impact on the accuracy and timing of warnings for future storms throughout the region, which could result in additional loss of life and property. Many NMHSs procure receiving systems for the direct reception of this important data, often from American equipment manufacturers, whose equipment would be the likely victim of radio frequency interference from the proposed strong terrestrial transmission signals.

While Ligado's filings have stated that non-U.S. federal entities can obtain NOAA satellite information from other resources via the internet, this is not a reliable solution during many weather hazard situations, especially hurricanes. It is crucial for forecasters and emergency managers, especially in hurricane prone areas, to be able to receive crucial geostationary satellite data without delay due to internet outages, which is often the first utility to be lost during severe weather. Destructive events can invalidate the "last mile" connectivity to NMHSs and decision makers, who now depend upon reliable direct reception in L-band. Much like emergency managers across the U.S., NMHSs in WMO RA-IV have come to depend on the Emergency Management Weather Information Network (EMWIN) to receive weather and satellite information. This information is transmitted via GOES satellites and can also be received in a timely manner without the use of internet. Solutions that propose cloud computing as a replacement for direct broadcast services are not reliable enough to safeguard forecasting and warning capabilities, especially in nations frequently in hurricane paths. GOES, the future GOES-R, EMWIN and the High Rate Information Transfer (HRIT) carry this important information, some of which originates in 1675-1680 MHz spectrum.

With this response, WMO wants to express its concerns regarding the FCC's plan to share 1675-1680 MHz radio spectrum between a new terrestrial broadband wireless provider and long established government meteorological data providers. Reliable, accurate, and timely data is imperative for NMHSs reliant on GOES and future GOES-R data, especially in North and South America, including Central America and the Caribbean. This technology plays a crucial role in public safety for millions of people beyond the U.S., and is particularly crucial to hurricane prone countries that can face considerable destruction and loss of life without GOES and GOES-R information for forecasts and warnings.

In addition, the global harmonization of spectrum allocation for meteorological purposes is of crucial importance to NMHSs and the users of their information across the world, such as emergency managers, first responders, public works officials, flood control districts, river authorities, reservoir operators, environmental agencies, air and maritime transportation operations, and local news media, to answer to the high level of public safety requested.

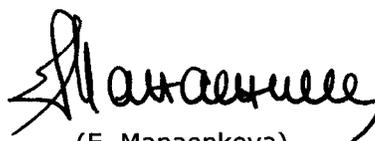
Meteorological and hydrological data have been derived from satellite systems since the 1960s. During a speech by President John F. Kennedy in 1961, best known as the call for the manned exploration of the moon, a fourth provision called for funds "for the

Weather Bureau – will help give us at the earliest possible time a satellite system for world-wide weather observation².” This provided the basis which we have today for the sharing and dissemination of satellite-based hydrometeorological data for the good of multiple industry sectors and the general public. The 1675-1680 MHz frequency band and the adjacent 1680-1695 MHz spectrum have and will continue to play an important role in realizing this vision.

WMO, therefore, urges you to take into account the information detailed above that illustrates the crucial importance of the 1675-1680 MHz frequency band for the international meteorological community. WMO also urges you to keep safe the worldwide allocation for meteorological interests, avoiding then any problematic precedence for the future.

We thank you for the opportunity to respond to this public notice.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'E. Manaenkova', written in a cursive style.

(E. Manaenkova)
for the Secretary-General

² https://www.nasa.gov/vision/space/features/ifk_speech_text.html