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| U.S. Radiocommunication Sector  Fact Sheet | |
| **Working Party:** ITU-R WP 7D | **Document No:** 24USWP7D\_13\_NC |
| **Ref.** Document 7D/244-E Annex 7 | **Date:** 01/24/2024 |
| **Document Title:** Updates to Working Document Towards a Preliminary Draft New Recommendation: Guidance to Administrations regarding Geodetic Very Long Baseline Interferometry Networks | |
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| **Purpose/Objective:** To provide relevant information and recommend protections for geodetic very long baseline interferometry networks. | |
| **Abstract:** Following the adoption of Question ITU-R 258/7 “Geodetic VLBI”, this working document towards a preliminary draft new recommendation describes Geodetic VLBI observations, which are required to deliver data products of utmost importance to a wide range of governmental, economic, societal and scientific purposes. This document recommends that administrations provide assistance in the protection of the stations of the International VLBI Service for Geodesy and Astrometry (IVS). | |

**United States of America**

UPDATES TO WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R RA.[GEOVLBI]

Guidance to Administrations regarding Geodetic Very Long Baseline Interferometry Networks

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| **Radiocommunication Study Groups** |  |
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| Source: Annex 7 to Document [7D/244](https://www.itu.int/md/R19-WP7D-C-0244/en)  Subject: Draft New Rec. ITU-R RA.[GEOVLBI] | **Document 7D/XX** |
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Summary

This document provides useful information to administrations wishing to protect their geodetic VLBI stations, which are critical infrastructure in many countries. It is noted that this document is based on previous work performed in relation to the Question ITU-R 258/7, which led to the new report, ITU-R RA.2507. Recent changes are identified in yellow highlight.



**Attachment**: 1

ATTACHMENT

WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R RA.[GeoVLBI]

Guidance to Administrations regarding Geodetic Very Long Baseline Interferometry Networks

(202x)

Scope

This Recommendation describes Geodetic VLBI observations, which are required to deliver data products of utmost importance to a wide range of governmental, economic, societal and scientific purposes, and recommends that administrations provide assistance in minimizing the interference to stations of the radio astronomy service which contribute to the international VLBI.

Keywords

Geodetic Very Long Baseline Interferometry (VLBI), Radio Astronomy Service (RAS), VLBI Global Observing System (VGOS), Geodesy, interference

Abbreviations/Glossary

IVS – International VLBI Service for Geodesy and Astrometry

RAS – Radio Astronomy Service

RR – Radio Regulations

UN – United Nations

VLBI – Very Long Baseline Interferometry

VGOS – VLBI Global Observing System

Related ITU Recommendations, Reports

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| Recommendation [ITU-R M.1583-1](https://www.itu.int/rec/R-REC-M.1583/en) | Interference calculations between non-geostationary mobile-satellite service or radionavigation-satellite service systems and radio astronomy telescope sites |
| Recommendation [ITU-R M.2101-0](https://www.itu.int/rec/R-REC-M.2101/en) | Modelling and simulation of IMT networks and systems for use in sharing and compatibility studies |
| Recommendation [ITU-R P.452-17](https://www.itu.int/rec/R-REC-P.452/en) | Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz |
| Recommendation [ITU-R P.676-13](https://www.itu.int/rec/R-REC-P.676/en) | Attenuation by atmospheric gases and related effects |
| Recommendation [ITU-R P.2108-1](https://www.itu.int/rec/R-REC-P.2108/en) | Prediction of clutter loss |
| Recommendation [ITU-R P.2109-2](https://www.itu.int/rec/R-REC-P.2109/en) | Prediction of building entry loss |
| Recommendation [ITU-R RA.517-4](https://www.itu.int/rec/R-REC-RA.517/en) | Protection of the radio astronomy service from transmitters operating in adjacent bands |
| Recommendation [ITU-R RA.611-4](https://www.itu.int/rec/R-REC-RA.611/en) | Protection of the radio astronomy service from spurious emissions |
| Recommendation [ITU-R RA.769-2](https://www.itu.int/rec/R-REC-RA.769/en) | Protection criteria used for radio astronomical measurements |
| Recommendation [ITU-R RA.1031-3](https://www.itu.int/rec/R-REC-RA.1031/en) | Protection of the radio astronomy service in frequency bands shared with active services |
| Recommendation [ITU-R RA.1513-2](https://www.itu.int/rec/R-REC-RA.1513/en) | Levels of data loss to radio astronomy observations and percentage-of-time criteria resulting from degradation by interference for frequency bands allocated to the radio astronomy service on a primary basis |
| Recommendation [ITU-R RA.1631-0](https://www.itu.int/rec/R-REC-RA.1631/en) | Reference radio astronomy antenna pattern to be used for compatibility analyses between non-GSO systems and radio astronomy service stations based on the epfd concept |
| Recommendation [ITU-R RS.2066-0](https://www.itu.int/rec/R-REC-RS.2066/en) | Protection of the radio astronomy service in the frequency band 10.6-10.7 GHz from unwanted emissions of synthetic aperture radars operating in the Earth exploration-satellite service (active) around 9 600 MHz |
| Report [ITU-R RA.2131-0](https://www.itu.int/pub/R-REP-RA.2131) | Supplementary information on the detrimental threshold levels of interference to radio astronomy observations in Recommendation ITU-R RA.769 |
| Report [ITU-R RA.2188-1](https://www.itu.int/pub/R-REP-RA.2188) | Power flux-density and e.i.r.p. levels potentially damaging to radio astronomy receivers |
| Report [ITU-R RA.2259-1](https://www.itu.int/pub/R-REP-RA.2259) | Characteristics of radio quiet zones |
| Report [ITU-R RA.2428-0](https://www.itu.int/pub/R-REP-RA.2428) | Parameters needed for the registration of distributed radio astronomy systems |
| Report [ITU-R RA.2507-0](https://www.itu.int/pub/R-REP-RA.2507) | Technical and operational characteristics of the existing and planned Geodetic Very Long Baseline Interferometry |

The ITU Radiocommunication Assembly,

considering

*a)* that Very Long Baseline Interferometry (VLBI) is the most accurate measuring technique to determine positions in the universe and on Earth and therefore a fundamental tool for science and applications in radio astronomy and geodesy;

*b)* that Report ITU-R RA.2507 contains technical and operational characteristics of existing and planned Geodetic VLBI systems, provides an operational overview of the world-wide network, and describes strategies to maximize its system performance;

*c)* that Geodetic VLBI products are the Celestial Reference Frame, the Terrestrial Reference Frame and the associated Earth orientation parameters such as the position of the rotational axis and the length-of-day;

*d)* that Geodetic VLBI observations are fundamental for the definition of global geodetic reference frames, and for the monitoring of Global Change parameters, for the applications of space navigation and satellite orbit determination by monitoring the Earth rotation parameters, and that these characteristics are also important for the advances in science of geodesy, space exploration and radio astronomy;

*e)* that Geodetic VLBI is realized by global networks of independent radio telescopes simultaneously observing cosmic radio sources on a daily basis;

*f)* that the frequency range 2–14 GHz is most favorable for Geodetic VLBI observations because of the physical properties of the atmosphere in this frequency range. Within this range, allocations to the radio astronomy service include 2 655-2 670 MHz (secondary), 2 670-2 690 MHz (secondary), 2 690-2 700 MHz (primary), 4 800-4 990 MHz (secondary), 4 990-5 000 MHz (primary), 10 600-10 680 MHz (primary/shared), and 10 680-10 700 MHz (primary). (see Table 2 of ITU-R RA.2507);

*g)* that VLBI network stations are increasingly exposed to emissions from terrestrial and spaceborne transmitters, which may degrade the performance of the observations and thus the quality of the geodetic data products;

*h)* that Report ITU-R RA.2507 contains the threshold levels of interference detrimental to VLBI observation systems, which were derived from Recommendation ITU-R RA.769;

*i)* that the Geodetic VLBI stations are part of a global network infrastructure, which can only function if all stations in the network can observe at the same time and in the same frequency bands without being disturbed by harmful interference;

*j)* that some Geodetic VLBI stations are located in radio quiet zones (see Report ITU-R RA.2259);

recognizing

that Geodetic VLBI stations are registered as RAS stations at the ITU-R;

noting

*a)* that Recommendation ITU-R TF.460-6 defines UT1 as UT0 corrected for the effects of small movements of the Earth relative to the axis of rotation (polar variation) and these movements are being observed by Geodetic VLBI;

*b)* that the further development of VLBI would benefit from administrations seeking to support radio astronomy observatories in research and development of methods of interference mitigation at the Geodetic VLBI observatories including enhancing receiver resilience and data analysis techniques.

*c)* that in seeking to protect VGOS stations from harmful interference, the protection levels provided in Recommendation ITU-R RA.769 can be taken into account, including protection levels in the 2690 MHz – 2700 MHz and 10.68 – 10.7 GHz bands, allocated exclusively to the passive services[[1]](#footnote-1);

*d)* that administrations typically notify any new Geodetic VLBI sites as radio astronomy service stations with the ITU-R;

*further noting*

that the UN General Assembly Resolution 69/266 calls for maintenance of a global geodetic reference frame for sustainable development;

Recommends

that administrations should consider the radio frequency environment (time and spatial) and preferentially choose an existing site with prior coordination requirements, such as a national radio quiet zone, when planning or introducing new Geodetic VLBI stations and coordinate, as appropriate, with neighboring countries;

1. Note that additional allocations in these bands do exist. See ITU WRC-07 Final Acts Article 5, 5.422 and 5.483. [↑](#footnote-ref-1)