Recommendation WG 03.17.001

Fixed Service Frequency Coordination in the Broadcast Auxiliary Service and Cable Television Relay Service Bands of 6875 -7125 MHz and 12700-13150 MHz

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Subject Area: Fixed Service (FS) Frequency Prior Coordination with the Broadcast Auxiliary Service (BAS) and Cable Television Relay Service (CARS)\(^1\) in the 6,875-7,125 MHz (7 GHz) and 12,700-13,150 MHz (13 GHz) bands.

Synopsis

This recommendation identifies issues that should be considered when coordinating FS point-to-point microwave usage in the BAS and CARS bands at 7 and 13 GHz. A summary and web link to the Federal Communications Commission (FCC) Report and Order (R&O) authorizing sharing between Part 101 FS stations, Part 74 BAS stations and Part 78 CARS stations is included to provide regulatory background. A description of the current usage of the BAS licensees and the potential impacts on the FS coordination process is provided.

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\(^1\) Originally called Community Antenna Relay Service; the CARS abbreviation was retained.
1. Regulatory Summary

Report and Order (document-FCC 11-120)
On August 9, 2011 the FCC released a decision that allows Fixed Service (FS) point-to-point microwave users licensed under part 101 of the rules to share certain spectrum bands currently used by BAS stations and CARS stations. This Report and Order, Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order in WT Docket No. 10-153 permits FS operations to share the 6,875-7,125 MHz (7 GHz) band and the 12,700-13,150 MHz (13 GHz) bands which broadcasters use for fixed, mobile and temporary fixed TV Pickup operations. (See below for a description of BAS operations).


The Commission began this proceeding in August of 2010 with the release a Notice of Proposed Rulemaking and Notice of Inquiry (NPRM/NOI). On June 7, 2011, the FCC issued a Public Notice that provided additional analysis of the existing BAS operations in the 7 and 13 GHz bands and requested supplemental comment on issues relating to FS sharing in those bands.

The R&O authorizes Part 101 FS stations to operate in 650 MHz of spectrum in the 7 and 13 GHz TV BAS bands, so long as they do not conflict with BAS operations, including TV Pickup stations. But the FCC also concluded that it is not feasible to allow FS to share spectrum with mobile and temporary fixed TV Pickup operations in areas where TV Pickup stations are licensed. In order to avoid interference between FS operations and TV Pickup operations, the new rules prohibit FS paths from crossing the operational areas of TV Pickup stations in the band (i.e., not just co-channel, but the entire band) of interest and require FS to coordinate with all relevant licensees in the 7 and 13 GHz band, including TV Pickup licensees. See Attachment 1 for maps of BAS and CARS TV Pickup operational areas, as of June 2011.

However, for areas where there are no TV Pickup licenses, the FCC concluded that sharing between Part 101 FS and fixed BAS operations is feasible. The FCC stated that this will permit FS operations in rural areas where the band is not currently licensed to TV Pickup stations.

Specifically, the new rules now allow Part 101 FS stations to share the 7 and 13 GHz bands subject to the following conditions:

- FS stations in the 7 and 13 GHz bands are not allowed to locate their paths within the service areas of any previously licensed TV Pickup stations in the respective 7 or 13 GHz band.
- FS operators are required to coordinate any new fixed links with TV Pickup stations within the appropriate coordination zones of any new fixed links.
- All fixed BAS and Part 101 FS stations in the 7 and 13 GHz bands are required to follow Part 101 prior coordination procedures.
- Two 25 MHz channels are reserved for BAS at 7 GHz (TV BAS Channel B5, 6975-7000 MHz and TV BAS Channel B6, 7000-7025 MHz) and 13 GHz (13150 – 13200 MHz) bands nationwide to accommodate TV Pickup stations covering events that occur outside the license areas of local BAS operations.
- Licensees of TV Pickup stations in the 6,875-7,125 MHz and 12,700-13,200 MHz bands are now required to register their stationary receive sites2 using the Commission’s Universal Licensing System (ULS). For FS sharing purposes, the top of the 13 GHz TV BAS band is 13,150 MHz.
- The FCC retained the 25 MHz channel bandwidth that presently applies to the 7 and 13 GHz bands, as this channel-width best conforms to existing operations in the band.

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2 See FCC Rule §74.605.
To provide for a mix of larger and smaller channel-widths, the FCC now permits FS to utilize 5, 8.33, and 12.5 MHz channels

50 MHz channels are allowed in the 13 GHz Band

The FCC applied the same technical parameters that currently apply in the adjacent Upper 6 GHz band to the 6,875-7,125 MHz band, namely:

- A maximum frequency tolerance of ±0.005% contained in FCC Rule Section 101.107;
- A maximum transmitter power of +55 dBW in Section 101.113;
- The antenna standards currently applicable to Upper 6 GHz Band stations authorized after June 1, 1997 in Section 101.115(b)(2);
- The capacity and loading requirements in Section 101.141(a)(3) and
- The 17 kilometer minimum path length requirement in Section 101.143.

The FCC also retained the rules that are already applicable to the 12,700 –13,150 MHz band, with the exception of applying the minimum payload capacity and loading requirements that currently apply in the 11 GHz band to the 12,700-13,150 MHz band.

As of October 21, 2016, the FCC has granted a waiver to General Communication, Inc. (GCI) (WT Docket No. 16-209) which approved their proposed operation of wideband (60 MHz) channels consuming the majority of the 6425-6525 MHz, 6525-6875 MHz and 6875-7125 MHz bands at 33 specific sites in Alaska. It is recommended that potential licensees investigate the existence of any new waivers granted by the FCC to other companies or in other regions of the country when considering licensing new paths in these bands.

2. Definitions

| BAS | Broadcast Auxiliary Service as defined in Part 74.602(a) for 7 & 13 GHz |
| Central Receive | Steerable microwave antenna and receiver intended to provide regional reception coverage. |
| Coordination Contour | See recommendation NSMA WG 3.90.026 |
| Operational Area | The area of operation defined on a BAS authorization |
| ENG Truck | Remote TV Pickup production vehicle. An ENG Truck typically contains a telescopic mast to facilitate transmission and/or reception of TV Pickup frequencies. |
| FS | Fixed Service Private or Common Carrier point to point microwave facility as defined in Part 101 of the FCC Rules |
| CMFC | Commercial Microwave Frequency Coordinator |
| TV Intercity Relay | Fixed point-to-point microwave facility primarily used for broadcast purposes but not used as a link to a television broadcast transmitter, television translator, or television booster transmitter site. |
| TV Studio-Transmitter Link | Fixed point-to-point microwave facility primarily used to convey broadcast programming from a television studio to the television broadcast transmitter site. |
| TV Pickup | Mobile and/or Temporary Fixed microwave facility primarily used to return live broadcast programming from remote broadcast locations to a television station studio. |
3. BAS Usage of the 7 and 13 GHz Bands

The vast majority of active licenses in the 7 and 13 GHz bands represent some sort of fixed, point-to-point facilities. Since the fixed systems are similar to those used in the Upper 6 GHz band and have successfully been coordinated by NSMA members using established procedures, it is believed that their usage is largely understood by the reader. On the other hand, TV Pickup facilities are thought to be unique. Therefore, this section will focus on TV Pickup usage.

Most TV Pickup operation is dedicated to the coverage of local news. TV Pickup facilities are also used for the coverage of sports, weather, and other special events. Informal discussions among broadcasters confirm that while many TV stations preferentially use 2 GHz BAS band frequencies for TV Pickup operations, increasing frequency congestion has driven an increase in 7 GHz and 13 GHz TV Pickup usage. This is particularly true in cities where it is feasible to use fiber optics for TV Studio-Transmitter Link purposes, which has contributed to an increasing number of 7 GHz and 13 GHz frequencies for TV Pickup usage.

TV Pickup licenses permit transmitters to operate within an area that is typically defined by geographical coordinates and a circular radius. Additionally, any TV station is authorized to operate a TV Pickup station on a temporary basis - even without a TV Pickup license.

By definition, news events cannot be anticipated and planned in advance. When a news event that merits live coverage occurs, a broadcaster typically dispatches a news crew and an ENG Truck to the scene with hopes of being able to produce useful, live coverage.

In routine cases, the ENG truck operator merely extends a pneumatic mast, aims the TV Pickup transmit antenna toward the Central Receive site and begins transmitting news programming back to the television station. The Central Receive site (also known as an electronic news gathering receive-only, or ENG-RO, site), is typically a high-gain, steerable antenna located on a high structure. Many TV stations locate their Central Receive sites atop their broadcast tower and/or tall building rooftops.

Terrain and building obstructions sometimes intercede by blocking the direct line-of-sight path. With sufficient experience, some TV station personnel develop a sixth-sense regarding when it is better to intentionally “bounce” their transmitted signal from nearby buildings rather than to attempt a direct shot. Although many news reports are received with minimal signal-to-noise margins, the demands of breaking news coverage generally favor this trial-and-error approach.

Some locations are the frequent source of news-related events. By way of example, government buildings, such as any town’s “City Hall,” would be expected to enjoy regular coverage of news conferences, scandals, and other such activities. In the effort to secure a reliable microwave shot, news crews regularly covering “City Hall” events would be likely to park their ENG truck at a location historically proven to transmit a good signal.

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3 Based on a 2015 search of the FCC Wireless Bureau Universal Licensing System database (“ULS”), the number of active 7 and 13 GHz stations were as follows: 4,771 TV Intercity Relay; 2,395 TV Studio-Transmitter Link; and 2,395 TV Pickup. Notably, because a single TV Pickup license authorizes many transmitters within a region, the actual number of transmitters cannot be determined using data retrieved from the FCC Wireless Bureau engineering database.

4 These conversations took place during regular NSMA BAS Coordination Committee Working Group 3 conference calls.

5 2025-2110 MHz

6 This congestion is due to increased use by incumbent broadcasters and additional stations now producing local newscasts.

7 Other means can be used to define a TV Pickup Operational area, including but not limited to City, County, and State boundaries.

8 Eligible TV Pickup users include television broadcast stations, Class A TV stations, television broadcast network-entities, low-power TV stations, and TV translator stations. See §74.600.

9 See FCC Rule §74.24.
to the TV station. In actual practice, there are hundreds of locations that are routinely the subject of news coverage.

In many broadcast markets, broadcasters will utilize multiple, permanent Central Receive sites to improve area TV Pickup reception coverage. When multiple Central Receive sites are used, they are typically designed to complement one another’s capabilities. For example, if desired signals originating from a certain neighborhood are regularly blocked by terrain or buildings from reaching one Central Receive facility, a TV broadcaster may employ a second Central Receive facility having good line-of-sight into that neighborhood. Some broadcasters install multiple Central Receive facilities along the periphery of a television market to reduce free-space loss, improve “look” angles, and allow improved frequency reuse from suburban and exurban areas. Central Receive sites are typically located within the TV Pickup station’s operational area.\(^{10}\)

To improve the likelihood of reception success, TV stations often locate Central Receive facilities at premiere sites such as the apex of very tall buildings, mountains, or broadcast towers in and surrounding the area. Further, receiver thresholds are typically optimized using various combinations of high-gain, steerable microwave antennas, low-noise preamplifiers, and bandpass filters. Because these hot-rod systems approach theoretical sensitivity limitations and the desired microwave signals are often sub-optimal due to their ad-hoc nature, these systems are typically prone to interfering signals.

Depending on the nature of the coverage event and specific coverage challenges, temporary Central Receive sites are also utilized from time to time. Such systems, which typically utilize small antennas supported by heavy-duty tripods, can be deployed in short order to building rooftops and hotel balconies. They can also be utilized from an ENG truck or an airborne platform such as a TV station helicopter. In most cases, these systems serve as a “hop” point to temporarily extend coverage to an area lacking an adequate path to a permanent central receive site.

In summary, TV Pickup systems typically transmit from antennas supported by ENG truck pneumatic masts to permanent receivers located atop tall buildings, mountains and broadcast towers. Additionally, transmitters and receivers can be operated from anywhere in and beyond the licensed operational area. Common sites for TV Pickup transmitters, receivers, or both include rooftops, balconies, and helicopters.

4. FCC FS Exclusion Zones

Exclusion area boundaries (based on BAS TV Pickup operational areas) are defined in a BAS facility license. Coordination databases sometimes identify the center of a coordination area rather than specific receive and transmit sites. In some cases, the corners of a rectangular (actually trapezoidal) area, which define the operational area by their NW and SE coordinate pairs. Most stations use a point and circle to define their operational area. Where ambiguous boundary descriptions are shown, such as “vicinity of [city]” the FCC will assume a circle with a 90 km radius from the center on the station’s community of license. No new 7 or 13 GHz FS stations may be licensed inside the respective band area boundaries or with their paths (between the link end points) passing through the boundaries. Boundaries will need to be updated as BAS licensees apply for operation in additional areas. Parties are cautioned that although the Universal Licensing System (ULS) allows geographic searches for the operational areas of Part 74 TV Pickup stations, a separate search is needed for Part 78 TV Pickup stations in the Cable Operations and Licensing System (COALS) database.

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\(^{10}\) The FCC doesn’t prohibit receivers at locations beyond the licensed Operational Area.
5. Maps of Operational Areas Created by the FCC

Operational area maps (See Appendix 1) issued in FCC PUBLIC NOTICE DA 11-1101 were created using the methodology and assumptions found in the attachment to the Public Notice. The FS path designer should be aware that these operational areas have changed since these maps were created. The designer should ensure there is no encroachment into an operational area using the methodology and assumptions stated in the Public Notice of the current authorized BAS facilities in the ULS and CARS facilities in the COALS.

6. BAS Fixed Receive End Points

FS users proposing fixed paths in the BAS band are obligated to protect fixed-link TV BAS paths, just as they have to protect the paths of existing FS stations. However, there are some BAS paths where the ULS database does not provide receive end data. This is generally for two reasons: First, because some BAS fixed paths were licensed prior to the existence of the ULS. The FCC database used prior to 1981 only required entering the transmit site coordinates, transmitting antenna elevation and main beam distance and bearing. When this legacy license data was imported into the ULS in 1999 the FCC dropped the distance information resulting in no ability to estimate the end point coordinates. Second, there were additionally instances where post-1981 TV BAS fixed-link records, which did have receive-end data, had that information lost when the link information was entered into the then-new ULS. Finally, there are also cases in which the receive end point information is available in the ULS, but may be incorrect. This may be due to accuracy limitations when using paper 7.5-minute topographical maps, especially when the path involved a new site, with no landmarks on the topographic map to allow the coordinate determination to a precision of ±1 second of latitude and longitude. This accuracy is now routinely possible using satellite imagery and/or GPS. The Commission has made several attempts to encourage BAS licensees to update their receive point information, but there are still fixed-link TV BAS records with missing receive-end data in the ULS.

FS links coordinated in the 7 and 13 GHz band are co-primary spectrum users. Coordinated new and modified fixed-link TV BAS paths must consider all existing FS links in the shared bands and engineer their paths to avoid creating interference issues.

7. BAS Mobile and Temporary-Fixed Link Operations

Proposed FS users should be aware that a TV Pickup license allows the licensee to operate anywhere in the operational area. There are also times when temporary transmit and receive sites will be utilized for special events such as parades, conventions, sporting events, etc. Broadcasters may use BAS spectrum for mobile operations such as “back pack,” street vehicles, airplanes, airship and helicopters. While these may transmit to a fixed receive site, there may be times they will transmit to temporary receive locations. FS users should be aware that these operations could be at any azimuth and distance in relation to a FS user’s fixed receive site and anywhere within the BAS licensee’s operational area. This could create a situation where an FS user could potentially receive interference from a TV Pickup user and, conversely, a TV Pickup user could potentially receive interference from a FS user. As explained below, the further away a FS user’s transmit or receive location is from the operational area, the less chance there is of interference occurring between FS and BAS users.
Because the urgency of electronic newsgathering requires very rapid deployment of ad-hoc, non-engineered microwave paths, it is not always practicable for TV Pickup licensees to evaluate interference potential with existing FS facilities. Interference is believed to be more likely in cases where the FS path is located near to the edge of the TV Pickup operational area, the FS path azimuth is aimed toward some portion of the TV Pickup operational area, or there is a lack of intervening terrain.

The primary interference mitigation solution offered by the FCC Report & Order is geographical separation between FS paths and TV Pickup operational areas. However, depending upon the actual distance, terrain, and orientation between the FS path and the TV Pickup operational area, this minimum required separation may sometimes be insufficient to prevent harmful interference. Further, interference to FS receivers is likely to be fleeting and difficult to identify due to the intermittent nature of TV Pickup activity.

8. BAS Temporary Operation

Any television licensee is allowed to operate, on a secondary basis, facilities in the BAS bands, including portable and temporary fixed operations pursuant to Section 74.24 of the rules. The regulatory requirements for this type of operation are as follows:

Section 74.24: All classes of broadcast auxiliary stations provided for in subparts D, E, F and H of this part, except wireless video assist devices, may be operated on a short-term basis under the authority conveyed by a part 73 license or a broadcast auxiliary license without prior authorization from the FCC, subject to the following conditions:

(a) Licensees operating under this provision must be eligible to operate the particular class of broadcast auxiliary station.

(b) The short-term broadcast auxiliary station shall be operated in conformance with all normally applicable regulations to the extent they are not superseded by specific provisions of this section.

(c) Short-term operation is on a secondary, non-interference basis to regularly authorized stations and shall be discontinued immediately upon notification that perceptible interference is being caused to the operation of a regularly authorized station. Short-term station operators shall, to the extent practicable, use only the effective radiated power and antenna height necessary for satisfactory system performance.

(d) Short-term operation under this section shall not exceed 720 hours annually per frequency.

(e) The antenna height of a station operated pursuant to this section shall not increase the height of any man-made antenna supporting structure, or increase by more than 6.1 meters (20 feet) the height of any other type of man-made structure or natural formation. However, the facilities of an authorized broadcast auxiliary station belonging to another licensee may be operated in accordance with the terms of its outstanding authorization.

(f) Stations operated pursuant to this section shall be identified by the transmission of the call sign of the associated part 73 broadcast station or broadcast auxiliary station, or, in the case of stations operated by broadcast network and cable network entities, by the network or cable entity’s name and base of operations city.
(g) Prior to operating pursuant to the provisions of this section, licensees shall, for the intended location or area-of-operation, notify the appropriate frequency coordination committee or any licensee(s) assigned the use of the proposed operating frequency, concerning the particulars of the intended operation and shall provide the name and telephone number of a person who may be contacted in the event of interference. Except as provided herein, this notification provision shall not apply where an unanticipated need for immediate short-term mobile station operation would render compliance with the provisions of this paragraph impractical.

Frequency coordination for this type of operation has historically been accomplished using local broadcast frequency coordinators. FS users should be aware such operations could occur within a television market that may or may not be defined as an operational area from FCC maps. This secondary basis operation should account for any FS links that have been proposed or licensed in the area of the TV Pickup operator and the operation should be coordinated with the FS users, or conversely, the local coordinator must take all FS facilities into account when they coordinate these kinds of operations.

9. Prior Coordination Notification (PCN)

There have been instances where a BAS user has not been notified of a proposed operation by the CMFC on behalf of a FS user. This has been due to a number of reasons. In cases where the protection agent is known to represent the affected BAS user, the PCN may be sent to that agency. In cases where the protection agency is uncertain or not known, the PCN should be sent to the address of the BAS licensee as shown in the ULS or as updated by licensee contact.

10. Interference Into ENG-RO Sites

For any TV Pickup station fixed ENG receive-only sites found in a point-radius search the following assumptions should be utilized for these sites in interference calculations:

Parameters to Utilize In Calculating Interference into Fixed BAS Receive Sites

- While BAS ENG-RO antennas (Central Receive sites) are typically directional, the systems are designed to provide 360 degree coverage and will typically use real-time steerable antennas or multiple “horn” style antennas with wide beam widths. Path designers could consider ENG-RO sites as operating with an omni-directional antenna to account for this operational characteristic.

- BAS receive sites may have multiple antennas associated with a single site located at different elevations on the supporting structure. It is recommended that the highest elevation be used in interference calculations.

- In the case of multiple antennas on a common structure the highest antenna gain should be utilized in the calculations.

- Since ENG-RO sites typically utilize preamplifiers near the antenna (and sometimes integral to the feedhorn itself), no receive line loss should be considered.
• TV Pickup operations utilize different polarizations depending on operational requirements. An interference analysis should presume the TV Pickup and FS victim antennas to be co-polarized if the TV Pickup station is licensed for multiple polarizations (which is generally the case).

• The elevation patterns of the ENG-RO receiving antenna will only be a factor at short distances. In most cases the elevation pattern should not be considered in the interference analysis. In cases where there is close proximity to an ENG-RO site, the FS user should be aware that ENG receive antennas typically have a broad elevation pattern.

11. FS Link Design and BAS Operational Area Consideration

FCC rules prohibit FS users from locating a transmit or receive site within a TV Pickup station’s operational area. Further, it prohibits the path between the transmit and receive ends from crossing any portion of the TV Pickup station’s operational area.

For new FS users desiring to operate in the BAS band, a point-radius search is recommended to determine if there is an overlap of the FS path and a TV Pickup station’s operational area. When the FS path and TV Pickup operational area do not intersect but are located close to each other, further consideration should be given as to potential interference that could be caused or received from mobile or temporary fixed BAS operations that may occur in the TV Pickup station’s operational area. What is not mentioned in the FCC WT Docket 10-153 rulemaking, but has the potential for interference, are instances where the FS station’s path beyond its receive end point extends into the TV Pickup station’s operational area. Consideration should be given to the possibility of interference into portable and temporary TV Pickup receive site as well as potential interference into a FS station’s receiving antenna from a TV Pickup licensee operating just inside its operational area.

12. Interference Into FS Sites

Parameters to Utilize In Calculating Interference from BAS Operations

• While TV Pickup transmit antennas may be shown in the ULS as being directional, transmissions may occur at any location within the operational area. Path calculations need to consider that the main beam of the TV Pickup transmitting antenna could be directed towards the FS station’s receive antenna.

• While typical transmissions may be towards an ENG-RO site there may be cases where temporary ENG-RO sites have been installed. This may result in the TV Pickup station’s signal extending beyond the temporary ENG-RO site and creating interference into a FS station’s receive site.

• The ULS database will identify the TV Pickup station’s transmitting antenna as being 6.1 meters above ground level. However, most ENG trucks are equipped with telescoping masts that will allow the transmit antenna to reach up to 60 feet (18.3 meters) above ground level. Further, TV Pickup transmission antennas could be airborne or located on top of high building structures for special events. This could potentially result in a further reach of the transmission beam beyond the operational area. [Changing from 52 feet AGL to 60 feet AGL harmonizes the maximum height of an ENG TX dish with the Appendix 4 height.]
• With TV Pickup transmissions potentially occurring anywhere in the operational area the probability of a location occurring on a high terrain point and the impact into a FS user should be considered.

• Pursuant to Section 74.636 of the rules, a maximum EIRP of 65 dBm for 7 GHz and 75 dBm for 13 GHz is allowed for TV Pickup transmissions. BAS users are allowed short term secondary operation pursuant to Section 74.24 of the rules. This operation would need to be coordinated with and consideration made for all FS links and TV BAS paths existing in the respective band.

• It should be assumed that the TV Pickup user is occupying the full allotted bandwidth of a channel as defined in Part 74.602(a) of the rules regardless of what is shown in the ULS database as part of the emission designator. It is common for TV Pickup users to “split” their channel for multiple transmissions within a single channel.

• TV Pickup operations can utilize different polarizations depending on operational requirements. An interference analysis should consider the licensed polarization for the TV Pickup and FS victim antennas. TV Pickup operations are typically licensed for multiple polarizations: Horizontal, vertical, right-hand circular and left-hand circular.
APPENDIX 1

Maps of 7 & 13 GHz FS Potential Operational Areas
From FCC Public Notice DA 11-1101, Attachment A & B

Mapping and Analysis - Methodology and Assumptions
The nationwide maps in Attachment A and B include all active TV Pickup and CARS facilities within the specified bands, excluding special temporary authority (STAs). Mobile TV Pickup operations were mapped using point and radius, area of operation or in cases where the license specifies “other” area of operation the location listed on the license was geocoded and a radius of 90 kilometers was assumed. Based on a review of all TV Pickup operations in ULS 90 kilometers is the average radius of all licenses that specified a point and radius. Population figures were calculated using 2000 census data. Population covered was determined by using data for the US Census tracts within the aggregated area of all TV Pickup and CARS licenses.

FS Exclusion Areas in the Respective 7 or 13 GHz Band Shown in Green *
(data released by the FCC as of June 2011)
* This data reflects the licensed TV Pickup areas as of June 2011. FS coordination efforts would need to consider current FCC data to determine changes in the exclusion areas. These maps do not cover territories or other areas outside of the fifty states but under FCC regulation and licensing requirements (this includes American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands among others, so exclusion areas would need to be determined in these locations through current FCC data).
# APPENDIX 2

## 7 and 13 GHz Frequency Plans

### 7 GHz - 25 MHz Channel Plan

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<tr>
<th>Transmit Low MHz</th>
<th>Transmit High MHz</th>
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<td>7037.5 (7025-7050)</td>
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<tr>
<td>6912.5 (6900-6925)</td>
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<td>7087.5 (7075-7100)</td>
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<tr>
<td>6962.5 (6950-6975)</td>
<td>7112.5 (7100-7125)</td>
</tr>
<tr>
<td>6975-7000 (TV BAS Channel B5)</td>
<td>7000-7025 (TV BAS Channel B6)</td>
</tr>
</tbody>
</table>

Reserved for Part 74 use only; NOT available for shared use with Part 101, regardless of whether inside or outside the operational area of a 7 GHz TV Pickup station

[per paragraphs 24 and 28 of the August 9, 2011, WT Docket 10-153 R&O/FNPRM/MO&O]

### 13 GHz 50 MHz Channel Plan

<table>
<thead>
<tr>
<th>Transmit Low MHz</th>
<th>Transmit High MHz</th>
</tr>
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<tbody>
<tr>
<td>12725 (12700 – 12750)</td>
<td>12950 (12925 – 12975)</td>
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<tr>
<td>12775 (12750 – 12800)</td>
<td>13000 (12975 – 13025)</td>
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<td>12875 (12850 – 12900)</td>
<td>13100 (13075 – 13125)</td>
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APPENDIX 3
Use Cases for TV Pickup Operations

PORTABLE MICROWAVE EQUIPMENT 1

ELECTRONIC NEWS GATHERING TRUCK

- Telescoping Mast up to 52 feet
- Maximum EIRP: 65 dBm 7 GHz
- Maximum EIRP: 75 dBm 13 GHz

DETAIL OF TYPICAL ANTENNA MOUNTED ON TRUCK

TYPICAL ENG TRUCK ANTENNA

- Bands: 2 & 7 GHz
- Gain 20, 30 dBi
- Beamwidth Azimuth: 14.2°, 4.2°
- Beamwidth Elevation: 19.5°, 6.8°
- Polarization: H, V, LHC, RHC
PORTABLE MICROWAVE USE CASE 1

TRUCK TO CENTRAL RECEIVE

Distance Up To Radius Authorized

DETAIL OF ONE MODEL OF ANTENNA

STEERABLE CENTRAL RECEIVE ANTENNA

- Bands: 2, 2.5, 6.5, 7 & 13 GHz
- Gain: 26 - 41 dBi
- Beamwidth Azimuth: 7.6° - 1.5°
- Beamwidth Elevation: 7.2° - 1.8°
- Polarization: H, V, LHC, RHC
- Rotation: 360°
- Many broadcasters have multiple receive sites
PORTABLE MICROWAVE USE CASE 2

PORTABLE TO CENTRAL RECEIVE

Distance Up To Radius Authorized

PORTABLE MICROWAVE EQUIPMENT 2

Portable “WINDOW LEDGE” UNIT
PORTABLE MICROWAVE USE CASE 3

RELAY SHOT TO CENTRAL RECEIVE

PORTABLE MICROWAVE EQUIPMENT AND USE CASE 4

ROVING “STINGER” UNIT

Omni-directional Transmit Antenna

Receiver near ENG truck

Transmitter mounted on back of camera
PORTABLE MICROWAVE USE CASE 5

AIRBORNE TO CENTRAL RECEIVE
APPENDIX 4

Methodology Option for Analyzing BAS Operational Areas

The purpose of the following analysis method is to provide a Part 101 Fixed Service (FS) microwave path design engineer a means to determine the probability of a FS receive site receiving interference from a temporary-fixed broadcast auxiliary (BAS) transmitter located anywhere within a BAS operational area.

As a preliminary analysis, conduct a coordination contour study using the distances defined in NSMA Recommendation WG3.90.026. If the distance between the FS receiver to the closest point within the BAS operational area is more than the coordination contour distance, there is a high probability that no further analysis of this BAS system is necessary. Otherwise, the following cell study is recommended to evaluate the potential for interference to the FS receive site from BAS operations.

The cell analysis is similar to the standard (TIA/EIA TSB10-F) method of performing interference calculations with the interferer (AB) being the BAS path and the victim (CD) being the Part 101 FS path. In the cell analysis, however, instead of a single calculation being performed, iterative calculations are made from multiple locations within the BAS operational area (see figure 1). The operational area is divided up into equally spaced cells (i.e. a grid), typically 0.5 to 1.0 km per side. Each calculation is made by placing a hypothetical BAS transmitter at a grid point location (site A) with the transmit antenna oriented toward a central receiver location (site B). Cells that are unable to provide adequate signal to the BAS receiver (site B) can most likely be ignored for further calculation of interference into the FS receiver (site D). See figure 2.

Results for each cell can be tabulated and placed on a map of the operational area showing the cells predicted to cause interference into the victim path (see figure 3). An interfering cell should be evaluated on the likelihood of that location being used by a BAS licensee. For example, a cell located in the middle of a lake or in an isolated uninhabited area would unlikely be utilized. Such cells could be ignored.

The above cell study should be repeated for each BAS receive site and the results overlaid on a map or placed on a spreadsheet to view the total number of cells that are predicted to cause interference into the FS receive site. See figure 4.

The above study should also be performed for any other BAS licensees that are either co or adjacent channel to the channel being used by the FS path.

For the cell analysis it is recommended that the following parameters be used

- Assume co polarization
- Use 60 feet for the BAS transmit antenna height above ground level
- Where multiple BAS transmit antenna beamwidths are shown in the authorization, use the antenna with the largest beamwidth [A TV Pickup license shows RX antenna gain and HPBW, but not the antenna make/model; you have to drill down in the ULS to get the RX antenna make/model.]
- Assume the maximum ERP authorized is utilized
- In cases where the receive antenna is known, assume the BAS receive antenna is aimed towards the BAS transmit antenna for each cell analyzed
- Utilize generally accepted engineering practices for Over-the-Horizon losses and interference thresholds
- It is recommended that a terrain database with three arc-second, or better, resolution be utilized.

RECOMMENDATION WG.03.17.001
In cases of multiple BAS licensees authorized to use a channel, check with the local frequency coordinator if a home channel plan is utilized.

Use TSB10-F procedures to determine if harmful interference is predicted from each cell. Keep in mind typical BAS usage would typically be less than one hour for any specific location. However, BAS is frequently and regularly utilized from various locations throughout the operational area.

Figure 1
Example of a BAS operational area defined by a center point and radius. Operational areas may also be defined by other means such as a rectangle or county.

Figure 2
Dark cells represent terrain obstructed areas predicted not to deliver a usable signal to a specific BAS receive site. The hypothetical FS receive site is beyond and to the northeast of the BAS operational area.

Figure 3
In this study, BAS transmitters are located at all non-shaded grid point locations and aimed at one of several BAS receive sites. The prospective FS receive antenna is pointed toward the operational area. Cells predicted to degrade the FS receiver by more than 1 dB are shown as red dots.

Figure 4
A composite overlay of multiple analyses with each analysis being conducted for a particular BAS receive site. Each red dot represents a cell predicted to degrade the FS receive site by more than 1 dB.
The composite overlay as shown in figure 4 but with the FS receive antenna aimed away from the operational area. Note the significant reduction of cells predicted to cause interference into the FS receiver.