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BY THE WIRELESS COMMUNICATIONS ASSOCIATION
AND ITS MEMBERS
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Licensing Proposal
70/80 GHz
FCC Docket 02-146

Background

- The FCC sought comment on several approaches for use of the millimeter wave bands.
    - Site Based (part 101) licensing
    - Unlicensed (Part 15) operations.
    - Geographic area licensing, with band managers preferred.
- Virtually all parties submitting comments in this proceeding strongly prefer a site-by-site approach and oppose the other approaches. The Federal government user community (which has co-primary status) also favors a site-based approach.
- The NPRM expressed concern with the site-based approach, largely because of the assumption that a separate application would be required for each link (and each subsequent modification of a link). The industry consensus is that the Commission can address this concern – and meet the operational and customer needs of providers and suppliers – with fairly minor streamlining of the existing Part 101 licensing approach.

General Principles

- WCA recommends that the FCC allow the use of 70/80 GHz links under its existing Part 101 authority, streamlined as appropriate to meet Commission concerns about the volume of applications received.
- In order for robust deployment to occur, the following critical conditions must be met:
    - Each link must have the degree of protection afforded by Part 101.
    - Applicants must be able to get into operation as soon as coordination is complete (as under Part 101).
    - The administrative burden on the Commission should be minimized, both for initial applications and for subsequent modifications.
    - Coordination of individual links should be streamlined so that both Government and Non-Government assignments are handled by third-party path coordinators.
- WCA believes these goals can easily be accommodated with little change to Part 101.

One Possible Licensing Approach

- Licensing would proceed almost entirely as it already does under Part 101:

- Any entity wishing to operate a 70/80 GHz link could apply for a traditional Part 101 authorization. (This requires only that the 70/80 GHz band be added to the existing Part 101 rules.)
- Coordination of the proposed path would be required, and would be conducted by a third-party path coordinator (as is typically the case already under Part 101). In practice, this would generally occur *before* the application was filed, so that virtually all applications would reach the FCC in grantable form.
- During the pendency of the application, existing section 101.31 would generally permit conditional operation as soon as coordination were successfully completed.
- The Commission would collect an application fee for each application plus an annual regulatory fee for each authorized link based solely on the minimal cost of regulation.

- Part 101 would be streamlined in two respects to reduce the volume of applications to the Commission:
  - Subsequent modifications would be authorized by rule whenever they could be successfully re-coordinated.
  - Additional paths operated by an existing 70/80 GHz licensee would be authorized by rule whenever they could be successfully coordinated.
  - If desired by the Commission, these streamlining measures could be limited to situations in which there are no exceptional requirements (such as international treaties, environmental assessment requirements, or antenna registration requirements).
  - All path information, and an authoritative database of all properly coordinated assignments, would be maintained (with full Commission access) by one or more third-party path coordinators, who would recover the cost of this database in their coordination fees.

Trusted Path Coordinator Process

- Under any WCA recommended licensing scheme, the path coordination process would be streamlined, and the burden on the Commission further minimized, through the use of "Trusted Path Coordinators" ("TPCs").
  - TPCs would include in their databases not just commercial assignments, but also non-classified Federal government assignments and, upon receipt of appropriate security clearances, classified government assignments. (Federal government users would have access to the database.)
  - The FCC would invite entities to be recognized as TPCs by demonstrating that they would adhere to well-defined criteria for processing coordination requests, updating their databases, sharing database information with the Commission and other government entities as appropriate, and exchanging database information with other TPCs. (TPCs would self-certify that they comply with these FCC criteria.)

- TPCs would recover the cost of their activities through the coordination fees they charge. (If only one TPC provides the database service, it shall obtain input from the licensees as to the appropriate fee among, and any dispute shall be submitted to Alternative Dispute Resolution).
- The substantive standards for successful coordination of paths and modifications would be exactly as they are today.

Licensing in the 70-80 GHz Bands (FCC Docket 02-146)
The Case for Site-Based (Path) Authorization and
The Significant Drawbacks of Using
Geographic Licensing and Unlicensed Approaches

Any licensing scheme the Commission adopts needs to be based directly on the transmission characteristics of the particular frequency band. The two most salient characteristics of the 70/80 GHz bands are the potential for fiber-equivalent throughput, and the fact that this tremendous capacity can be transmitted in very tight beams – "pencil beams" – rather than the wider beams in lower bands.

Pencil beams only interfere when they are in complete alignment. Consequently, the opportunity for harmful interference in these upper milliwave bands is *de minimus*. For licensing, this means the Commission rarely confronts issues of spectrum scarcity and has no need to deal with issues surrounding mutually exclusive licensing requests, through the adoption of auction rules. At the same time, the fact that these links will be used for extremely high amounts of data means that most users will require complete assurances of non-interference, which an unlicensed approach cannot provide. As demonstrated in the filings of virtually every commenting party, the site (path) authorization approach best meets the public's need for links with both high capacity and high reliability. It would in effect create spectrum (spatial) pipes, with the Commission defining the boundaries and permitting flexible use within each pipe. Further, by employing the streamlined path authorization approach of the commenters, the Commission will accelerate deployment by a vast number of users while simultaneously reducing its administrative burdens.

In contrast, for a geographic licensing approach (with auctions and possibly band managers) to be implemented, the Commission must artificially draw boundaries and create scarcity. These boundaries, however, will have no nexus to the actual types of links that will be deployed in these bands. In addition, a band manager licensing approach will result either in a regional monopoly on fiber-equivalent wireless capacity (*i.e.,* an entity with market power controlling each license and extracting excessive rents) or in the channelizing of the bands for competitive reasons, which would destroy the promise of fiber-equivalent transmission speeds. Either would inhibit commercial deployments, either by limiting supply or by eliminating demand. Finally, this approach is not supported by the Federal government, which has co-primary status in these bands.

An unlicensed approach is equally problematic. Because of the cost of links in these bands, they will be used by sophisticated customers whose data requirements that cannot be satisfied in lower frequencies. Just as they demand fiber-equivalent capacity, these customers will demand fiber-equivalent reliability. Without licenses, it will be very difficult to track down and coordinate with other (anonymous) users to avoid interference. (This is an especially thorny problem because transmissions in these bands can travel more than 10 miles.) As a result, customers would incur additional costs to insure against interference – and investors will be deterred from providing the capital needed to bring this technology to market. Finally, an unlicensed approach would conflict with the needs of the Federal government users to have complete assurances of non-interference, especially with "classified" links.

70 – 90 GHz Registration

Submitted by: Chris Hardy, VP Spectrum Management

Industry registration of links in the 70 – 90 GHz band can provide users with a high level of operational stability by analyzing and minimizing interference conflicts prior to deployment and by assigning primacy in the band. This process will relieve the administrative burdens on the Commission associated with traditional site-by-site licensing and will streamline access and sharing of the band between commercial and government users on a non-interference basis. Commercial web-based applications are currently available to analyze interference between point-to-point and point-to-multipoint systems and many of the same features found in these tools would be applicable to the 70 – 90 GHz band registrations.

It is anticipated that one or more designated Trusted Path Coordinators (TPC) would manage the registration process, serving as link registration agents for commercial and potentially government users.

The six basic elements of the registration process include:

1. Web-based Access and Security
2. Data entry
3. Engineering analysis
4. Coordination/notification
5. Certification
6. Data query and modifications

Each of the elements is described below. Figures 4 and 5 represent a step-by-step flow of the process.

1. Web-Based Access and Security

A web-based system will provide quick access to data and increase the efficiencies in the registration process. The basic functionality of a web-based system would include the following:

- Users can enter technical parameters for interference analysis, frequency assignment, and coordination/notification.
- System will generate Link Registration Certificates for Operators.
- Links will be considered in future analyses immediately after obtaining link certification or initiating coordination.
- System will allow users to update administrative and technical information of links that are registered to the licensed operator associated with the login account.
- Permission and Security rights will differ between types of Users to protect classified and sensitive data. Four categories of Users are envisioned:

User Category	Access Rights
Commercial	System access will require a Login account created by the Trusted Path Coordinator (TPC). Access to other commercially operated links and non-classified Federal Government links will be limited to view only. Commercial users will not have access to view Federal Government links designated as classified.
Federal Government Agencies	Will work through the NTIA to establish access rights and a Login ID and password with the TPC.
FCC	User access rights to be designated by the Wireless Bureau.
Trusted Path Coordinator	Full access and permissions required to perform Level 2 interference analyses and to maintain the system

2. Data Entry

The User would enter the operational parameters of the link. At a minimum, the following information would be required:

- Transmit and receive site names
- Transmit and receive site coordinates – Although Part 101 requires datum accuracy to the nearest second, accuracy to the nearest 10th of a second is recommended, when possible.
- Street addresses and a description of the physical site location (ex. rooftop, window access)
- Ground elevation AMSL - Value can be automatically derived from coordinates.
- Antenna make and model
- Antenna centerline height AGL
- Transmitter make and model
- Transmit power
- Frequency range

Data verification would identify data anomalies and allow the user to make corrections. Figure 1 shows a data entry screen in a commercial microwave link interference analysis tool.

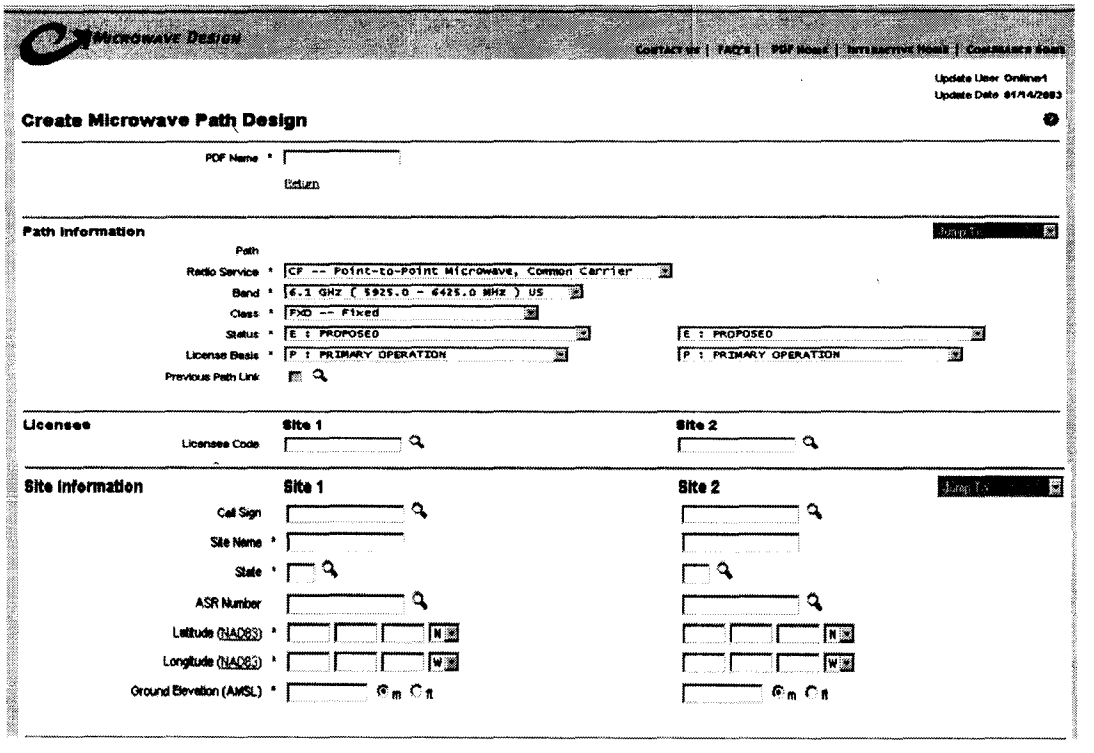


Figure 1: Sample Link Data Entry Screen

3. Engineering Analysis
Once the link data is entered and subsequently accepted for processing, an engineering analysis is performed that considers all of the previously entered links within a defined coordination contour.[1] Operational parameters are considered as well as the appropriate interference criteria. An initial Level 1 interference analysis is conducted based upon "worst case" parameters (ex. no man-made obstruction losses considered and full band operation assumed). High resolution NED terrain data would be used to calculate obstruction losses due to terrain.

The Level 1 analysis would determine if no other registered systems (commercial, classified and non-classified federal, or radio astronomy facilities) were identified within the coordination contour. In this scenario, registration would be considered complete and the certification would be issued.

If a link did not meet the Level 1 analysis criteria, the link data would be submitted to the TPC for further analysis and coordination. The following scenarios would be considered:

Scenario 1: All Clear, Coordination with commercial systems required.
Other entities identified within the coordination contour but link meets interference objectives. If a single TPC is designated, registration is complete. If multiple TPC's, coordination information is forwarded electronically on a daily basis and a response from other TPC's is required within 3 - 5 days.

Scenario 2: All Clear, coordination with government systems or quiet zones required.
Link meets interference objectives with commercial systems but government systems identified within the coordination contour or quiet zone area of concern triggered. If a single TPC is designated and is given authority to analyze links on behalf of government agencies, registration is complete. If multiple TPC's or if another government entity is established to perform the interference analysis, coordination information is forwarded electronically on a daily basis and a response is expected within 3 – 5 days.

[1] The coordination contour is defined to be the area in which links may be considered potentially affected and can be derived by using the "worst case" operating parameters (powers, antenna patterns, bandwidth) and considering typical path loss due to propagation effects. For Part 101 microwave point-to-point systems, this area is currently defined by a circular distance around a transmitter with an area extending out +/- 5 degrees from antenna boresight. Classified government links would be considered in the level 1 search based upon a general area of operation rather than a distinct link.

Scenario 3: Link fails to meet interference objectives
A level 2 analysis would be conducted employing mitigation techniques such as obstacle blockage/shielding, power, bandwidth and antenna adjustments. It is also possible to incorporate 3D building data to further calculate obstruction losses in urban settings, as shown in Figure 2. Incumbent contact to gain acceptance of the proposal is also considered. Once a viable solution is determined, coordination is required as discussed above.

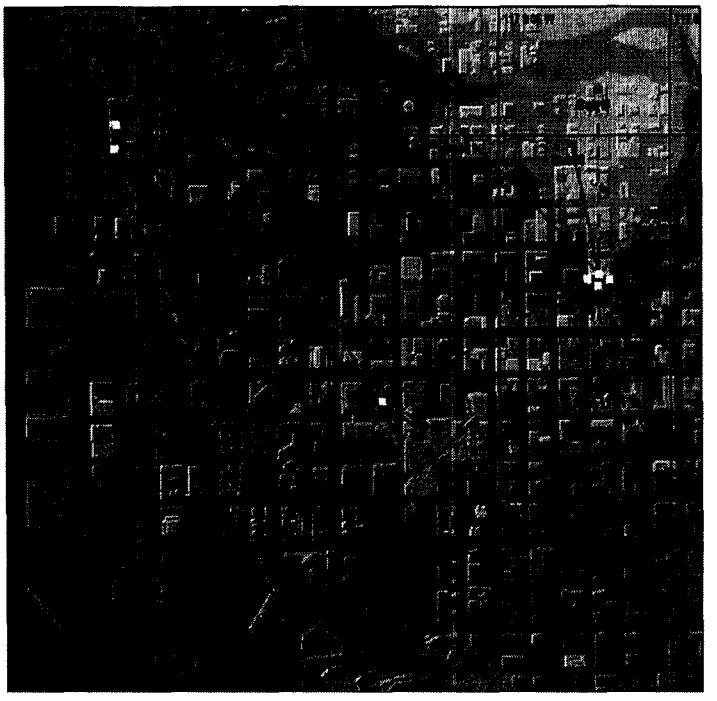


Figure 2: 3D Building Analysis

4. Coordination/Notification
If multiple TPC's or if another government entity is established to perform the interference analysis, coordination information would be forwarded electronically within a 24-hour period and a response would be expected within 3 – 5 days. The TPC would address objections received within the 3 – 5 day window.

5. Certification
Once the proposed link receives final approvals through the processes defined above, the link is certified to operate. Notification of certification will be delivered via email. Links will be entered into the database and the date and time stamp assigned will be considered as determining primacy in the band. Entities will have six months to complete construction of the link and update the link status in the database. After six months, the certification will expire and require renewal.

6. Data Query and Modifications

Subsequent modifications to a certified link that do not change the interference potential do not require re-certification. Modifications to a link that increase the potential for interference will lose primacy in the band and require re-certification. The data query and modification process is detailed in Figure 5. Figure 3 shows a database query screen in a commercial microwave interference analysis tool.

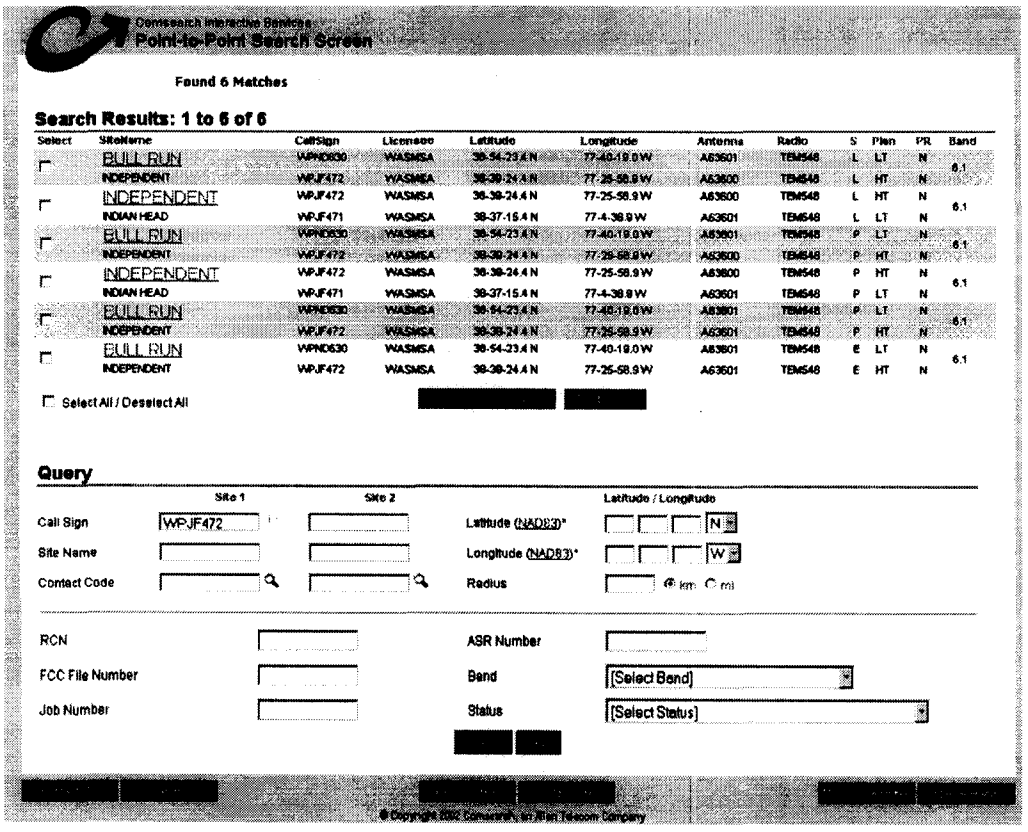


Figure 3: Sample Data Query Screen

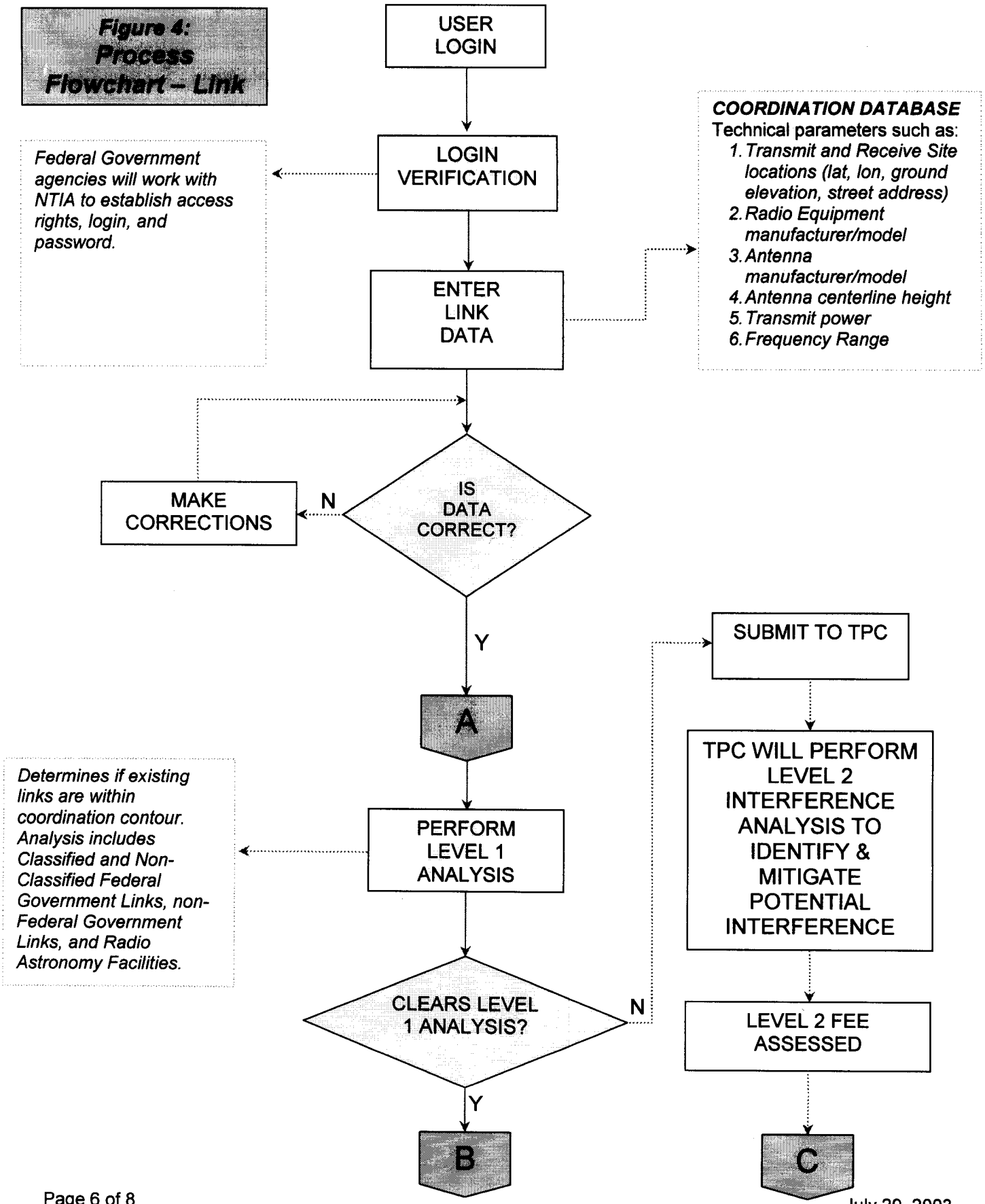
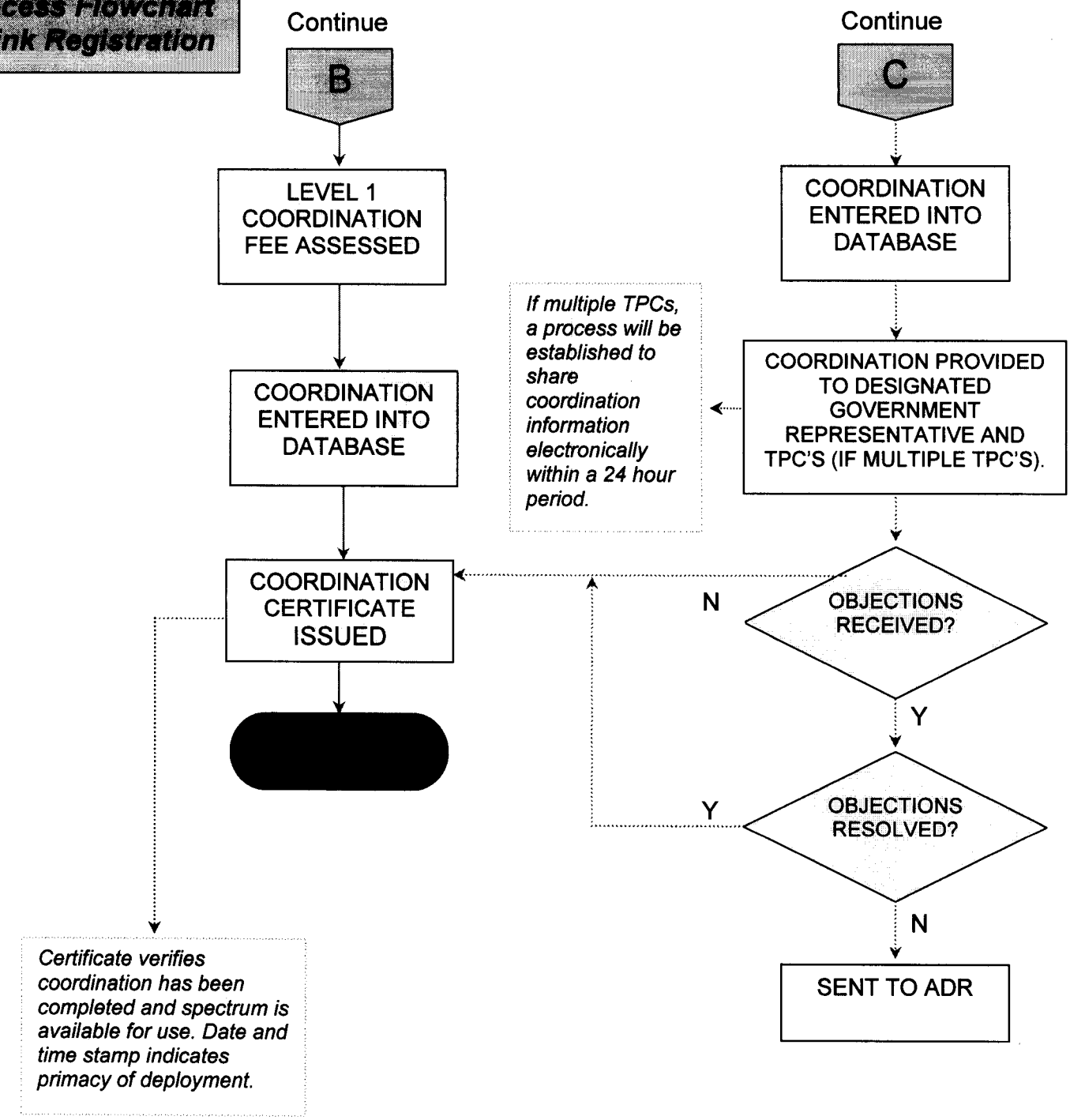


Figure 4: Process Flowchart – Link
USER LOGIN
LOGIN VERIFICATION
Federal Government agencies will work with NTIA to establish access rights, login, and password.
ENTER LINK DATA
COORDINATION DATABASE
Technical parameters such as:
1. Transmit and Receive Site locations (lat, lon, ground elevation, street address)
2. Radio Equipment manufacturer/model
3. Antenna manufacturer/model
4. Antenna centerline height
5. Transmit power
6. Frequency Range
IS DATA CORRECT?
N
MAKE CORRECTIONS
Y
A
PERFORM LEVEL 1 ANALYSIS
Determines if existing links are within coordination contour. Analysis includes Classified and Non-Classified Federal Government Links, non-Federal Government Links, and Radio Astronomy Facilities.
CLEARS LEVEL 1 ANALYSIS?
N
SUBMIT TO TPC
TPC WILL PERFORM LEVEL 2 INTERFERENCE ANALYSIS TO IDENTIFY & MITIGATE POTENTIAL INTERFERENCE
LEVEL 2 FEE ASSESSED
Y
B
C

Figure 4 (cont'd): Process Flowchart – Link Registration



Note: Entity has six months to install link and change the link status in the database.

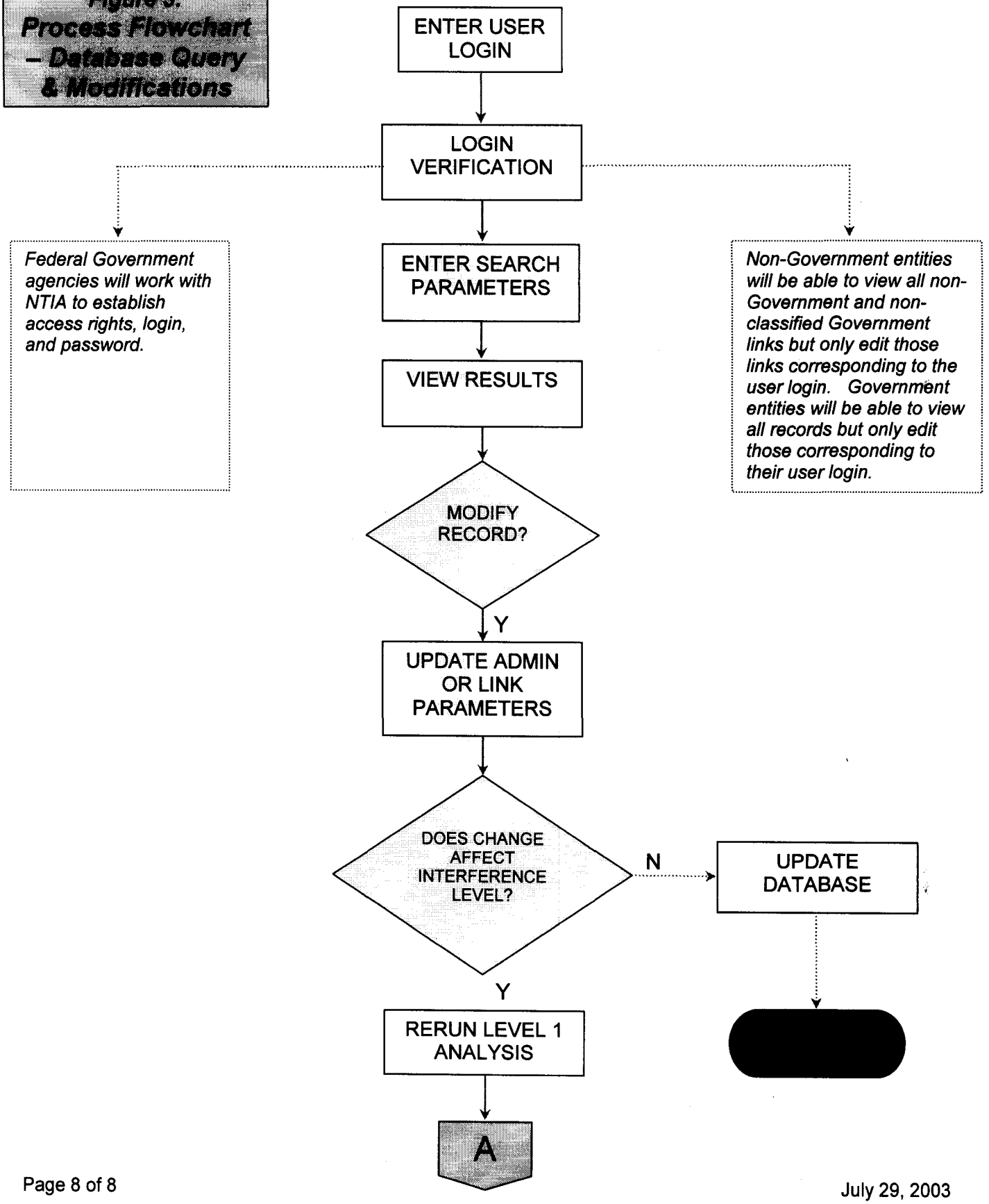



Figure 5: Process Flowchart – Database Query & Modifications