Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementing Public Safety Broadband Provisions of the Middle Class Tax Relief And Job Creation Act of 2012	)	PS Docket No. 12-94
	)	
Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band	)	PS Docket No. 06-229
	)	
Service Rules for the 698–746, 747–762 and 777–792 MHz Bands	)	WT Docket No. 06-150

COMMENTS OF GENERAL DYNAMICS C4 SYSTEMS

I. INTRODUCTION

General Dynamics C4 Systems, a business unit of General Dynamics, is pleased to respond to the Federal Communications Commission's ("the Commission") request for comments on the Notice of Proposed Rule Making 13-31 (the "NPRM"). We respond to the NPRM in our capacity as a manufacturer of Long-Term Evolution (LTE) radio access, core network, and user equipment; and as a leading participant in the 3GPP (3rd Generation Partnership Project), a leading global standards body for LTE. General Dynamics' broad portfolio includes network system integration at the national, regional, and local scale; LTE modems, cores, and endpoint devices; mesh networks; satellite communications-based

backhaul; network design, operations, infrastructure, sites, and towers; secure mobility; and public safety applications software for the enterprise and end-users.

Based on a fifteen-year record of providing mission-critical public safety networks, General Dynamics provides competitive, differentiated offerings in most of the public safety network value chain. General Dynamics' client base in this area includes New York City; the Los Angeles Regional Interoperability Communications System (LA-RICS) region; Adams County, Colorado, near Denver; the U.S. Coast Guard; and major telecom carriers across the nation. Acquiring elements of GTE and Motorola in 1999 and 2001 respectively, General Dynamics created a core capability in terrestrial and satellite-based digital communication networks and mission-critical radio networks. Since then, we have been successful as a network provider for U.S. mission critical agencies including the Department of Homeland Security (DHS), the Department of Justice (DOJ), the Department of Defense (DoD), and the National Aeronautics and Space Administration (NASA).

For commercial networks, General Dynamics provides engineering, infrastructure, and services for systems around the country, including more than 40,000 cell towers. As the broadband wireless revolution took hold, General Dynamics added capability in situational awareness, LTE technology, trusted computing, and secure mobility. For example, the 2012 General Dynamics acquisition of IPWireless provided intellectual property in technology and manufacturing process and the system-level capabilities including integrated Radio Access Network/Core/User Equipment offerings in the LTE market, focusing on public safety and municipal agency submarkets. After the acquisition, we continued contributing to 3GPP including ongoing support of public safety, with approximately 2500 contributions to date in many of the key features, more than 100 "Tdoc" Public Safety contributions to date to 3GPP,

and key white papers including "Shaping LTE To Address The Needs Of The Public Safety Community".

II. DISCUSSION

A. General Comment. The Commission Should be Commended for its Efforts to Unify the Technical Service Rules Across the 700 MHz Band

General Dynamics C4 Systems strongly supports the proposed rule making unifying the technical service requirements applicable to D Block spectrum (758–763MHz/788–793MHz) and the existing public safety broadband spectrum (763–768MHz/793–798MHz). Removing the service rules for D block from Part 27 and placing them in Part 90 will allow equipment intended for providing public safety services in both D block and public safety broadband spectrum to be certified using a single set of rules. Unifying the rules for these two spectrum allocations will also make it possible to provide a single service spanning these two frequency allocations, which is not possible under the current service rules. As an added benefit, while the single regime will provide operational, cost, and schedule benefit to public safety, the industrial base will benefit because duplicative certification processes will be eliminated.

B. Comments in Response To The Commission's Proposed Rules to Ensure the Successful Deployment of Channel 14 for Public Safety Agencies and First Responder Network Authority (FirstNet): Certain Specific Technical Changes Should be Adopted

In the following paragraphs we provide our comments on selected paragraphs in the NPRM, all relating to the Technical Service Rules.

1. Regarding Paragraph 19. Power and Antenna Height Limits

General Dynamics C4 Systems supports the proposal to modify Section 90.542(a) to bring the D Block frequencies within the Section's scope and to delete the redundant provisions of Section 27.50(b). The power strength and antenna height limits prescribed in

section 90.542(a) are appropriate for the expanded public safety broadband allocation, since public safety systems based on LTE have a maximum range of 100km. This upper limit is determined by system implementation and is unlikely to be increased by link budget parameters such as increased transmit powers. Being so, there is little benefit in the Commission re-examining local population density thresholds in the context of public safety services.

2. Regarding Paragraph 20. Terminal Power Limits

After carefully considering the 3GPP standard prescription of 200mW for LTE portable stations and based on our long-term in-depth participation with 3GPP as a user equipment manufacturer-stakeholder, General Dynamics C4 Systems supports the current 3W power limits in 90.542(a) because of the Power Class 1 UE (User Equipment) definitions in the 3GPP in LTE Release 11 specifications, which specify a maximum output power of +31dBm (+2/-3dB), see 3GPP TS36.104, table 6.2.2-1 ("the Output Standard"). Under these specifications, the maximum allowed output power of the portable station may be as high as 2W, a level between the existing standard of 3W and the 3GPP standard of 200mW. There seems little benefit in foreclosing manufacturer's flexibility by imposing a limit more restrictive than might be implied by the Output Standard, especially in light of the more permissive existing standard. A more restrictive limit would negate some manufacturers' research and development investment-to-date in terminals exceeding the 200mW level. Furthermore, lower UE transmit power could greatly impact ongoing system-level engineering trades for the emerging National Public Safety Broadband Network (NPSBN) being designed by the FirstNet.

As cell site density for the NPSBN is partially dependent on UE transmit power, any decision to decrease the maximum allowable UE transmit power could have far-reaching cost and schedule impacts on the deployment of the NPSBN. The FCC would be prudent to consider these impacts before changing the standard. If, as General Dynamics C4 Systems suggests, the standard is not changed, operational risk will not be increased, because LTE incorporates the power control of the portable station transmit power. Therefore high power UEs will be prevented from causing excessive interference even at the level of the Output Standard or higher. Finally, we note that the radio frequency radiation exposure limits set out in Section 1.1310 also apply and will in some use cases impose lower transmit powers on portable equipment, regardless of the power limit set in Section 90.542(a).

3. Regarding Paragraph 21. Power Strength Limits (Power Flux Density)

General Dynamics C4 Systems supports the proposal to remove the D Block frequencies from Section 27.55(c) and to expand the frequency ranges governed by Section 90.542(b) to cover the D Block frequency range. Our analysis confirms that the power flux density limits already defined in Section 90.542(b) are appropriate for the expanded public safety broadband allocation. We also recognize the need to maintain protections of the public safety narrowband allocation (769–775/799–805 MHz) and strongly favor preserving the limits currently defined in 90.543(e)(1) and (2).

4. Regarding Paragraph 24. Protection of Global Positioning System (GPS) Services

General Dynamics C4 Systems strongly supports the consolidation of the emission limits codified in Sections 27.53(f) and 90.543(f) as protection of GPS services is viewed with great importance.

The expanded public safety broadband allocation covers the frequency range 758–768MHz/788–798MHz. Transmissions in the upper portion of the expanded public safety broadband spectrum allocation have second harmonic terms that fall within the proposed GPS protection range of 1559–1610MHz, therefore retaining the phrase "including harmonics" is necessary to ensure that the rules are unambiguous about restrictions that are placed on harmonics of intended transmissions.

Also of note, modern terminal designs intended for public safety services have integrated GPS receivers. Since manufacturers are adequately motivated to design terminals that do not self-interfere, terminal designs will meet the proposed emission limits in the GPS band by default. Considering that the additional cost impact to manufacturers from the suggested phrase will be minimal, General Dynamics C4 Systems supports the inclusion of the suggested phrase in the interest of incremental clarity and completeness.

5. Regarding Paragraph 25. Emissions into Commercial Spectrum Bands

General Dynamics C4 Systems supports applying the emissions limits of 43 + 10log(P) as currently defined in Sections 27.53(d)(3) and 90.543, in order to provide protection to other commercial services.

It is likely that public safety systems based on LTE technology will have to co-exist with commercial services operating in adjacent spectrum like services provided in C Block (746–758MHz /776–788MHz). Given that existing rules for D Block provided explicit protection for these services, it will be inconsistent if the rules codifying operations in the expanded public safety broadband allocation did not afford commercial services the same protection. As the public safety narrowband allocations already provide this basic level of protection (see Section 90.543(c)), applying these same rules to broadband will ensure consistency.

These emissions limits are relatively straightforward to achieve by fixed, mobile and portable stations, therefore adopting the 43 + 10log(P) emission requirement of Section 27.53(d)(3) will not impose any additional cost on public safety station equipment.

6. Paragraph 26. Field Strength Limits

General Dynamics C4 Systems supports the adoption of field strength limits at the geographical border of the licensed public safety service area in order to facilitate co-existence with potential State Networks. Adopting the field strength limits defined in Section 27.55(a)(2) will limit the interference levels presented in other service areas.

Note that 40uV/m field strength corresponds to a power density of approximately –83dBm/m^2. Given the aperture of an ideal isotropic antenna, this suggests that the power collected by a station on the ground will be close to –102dBm at the border region and will represent minimal interference into a neighboring network using the same spectrum allocation.

7. Paragraph 29. International Considerations

General Dynamics C4 Systems is supportive of the proposal to move the restrictions on the use of D Block frequency ranges in geographical proximity of international borders to fall within the remit of Section 90.533, for reasons of administrative consolidation as discussed previously.

8. Regarding Paragraph 32. Flexible use of narrow band.

The Commission requests comment on the impact of flexible use of the narrowband allocation on the interference protection criteria applicable to FirstNet's [i.e. broadband] operation in this guard band.

General Dynamics notes that the technical impact is dependent on the case. For example, if the public safety narrowband spectrum is used for public safety broadband communications based on LTE technology, the guard band is not required to mitigate against

interference concerns because LTE systems can co-exist on adjacent channels allocations. On the other hand, if broadband services and narrowband services were expected to share the public safety narrowband spectrum, it will be necessary to ensure a guard band between the two services was provided within the public safety narrowband spectrum allocation. As narrowband utilization of this spectrum is not uniform throughout the United States, many detailed local analyses will be required to identify those areas where interference could arise.

Under the proposed rules, the public safety narrowband spectrum and expanded public safety broadband spectrum will still be defined as separate bands, which would prevent a single transmission channel spanning the boundaries of the two bands (and the guard band between them). This restriction will limit the occupancy of the combined public safety narrowband and broadband spectrum allocations. Any benefit obtained from being able to reclaim the guard band for broadband services needs to be balanced against the additional complexity of the channel arrangements needed to fully use the full 17 MHz (758–775MHz / 788–805MHz) made available by the combined expanded public safety broadband and narrowband allocation.

Technical matters aside, the operational impact of the proposed flexible use will fall most heavily upon the public safety community. Their assessment of the operational value to public safety of allowing broadband use of the 769–775 MHz /799–805 MHz spectrum above and beyond what is already specified in 6201(a) of Public Law 112-96 should be weighed accordingly against potential negative impacts such as spectrum inventory, re-banding, and unanticipated interference.

9. Regarding Paragraph 34. Removal of demonstration of support for LTE interfaces from 90.203(p).

General Dynamics C4 Systems supports the proposal to remove from Section 90.203(p) the requirement to demonstrate support for the LTE interfaces required by 3GPP

TS23.401 based on the referencing of 3GPP TS23.401v8.8.0 by section 90.203(p). The 3GPP document describes the architecture of the core network function that supports the LTE radio access network. This document concentrates on the core network interfaces, treating the radio access network as a single functional element. Strictly speaking, the only interface defined in this document that is supported by a transmitter is the S1 interface (both the user plane aspect, S1-U, and the control aspect, S1-MME). LTE transmitters will need to support the necessary interface in order to connect to the evolved packet core network as this is the only core network option that is defined to support the LTE radio access network (also known as E-UTRAN – evolved UMTS radio access network). The self-explanatory standard is sufficient on its own and is incorporated by reference. Without access to the historical basis for the inclusion of the clause in the NPRM, we see no special reason to include the clause by citation.

10. Regarding Paragraph 35. Additional certification requirements.

General Dynamics C4 Systems supports the proposal to add the D Block frequency ranges to Section 90.549. No spectrum-unique certification restrictions on equipment operating in the expanded public safety broadband spectrum allocation appear to be necessary. The inclusion of the D Block frequency in this section will have the benefit of eliminating duplicative certification processes, thereby reducing cost.

Given the unique mission-critical requirements of public safety communications, we recommend that certification for public safety should be governed by one regime, and that non-public safety spectrum should be excluded from this single public safety certification regime.

III. CONCLUSION

General Dynamics C4 Systems appreciates the opportunity to comment on the NPRM. As the Commission notes in the NPRM, the unification of D Block with the prior Public Safety spectrum provides an opportunity to combine overlapping rule sets. Implementing these aspects of the Commission's proposed NPRM will simplify certification and accreditation processes, thereby reducing cost and increasing efficiency for the manufacturing community.

Respectfully Submitted,

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