



Comments from
GLOBALFOUNDRIES
on
National Strategy to Secure 5G Implementation Plan

85 Fed. Reg. 32016 (May 28, 2020)
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GLOBALFOUNDRIES is pleased to submit these comments to NTIA in response to request for comment on National Strategy to Secure 5G Implementation Plan, 85 Fed. Reg. 32016 (May 28, 2020).

GLOBALFOUNDRIES (GF) is the world's leading specialty semiconductor foundry, the second largest pure-play foundry in the world and the market leader in RF technology. GF provides a range of differentiated manufacturing solutions to "fabless" design companies and original equipment manufacturers around the world and is at the core of the global transitions to 5G, Internet of Things and AI (artificial intelligence), amongst other macro technology trends.

The company, headquartered in California, employs over 15,000 employees worldwide (7,000 of which are in the United States) with five major manufacturing locations in the United States (New York and Vermont), Germany (Dresden) and Singapore as well as multiple sales and support offices in close proximity to its customers. GF has invested more than \$15 billion in U.S. semiconductor manufacturing over the last 10 years and is a long-time producer of Trusted, ITAR, and highly restrictive ECCN EAR export controlled goods at Fab 9 in Vermont and Fab 10 New York. GF recently announced that such ITAR and EAR capability will be enabled at Fab 8 in New York by the end of 2020. With these capabilities, GF is positioned to be the leader for 5G and 6G, for commercial, dual use, and defense applications.

GF supports efforts across the entire 5G value chain, with a special focus on high speed wireless and optical communications. As a member of the SIA, we also support the comments to the plan as provided separately by the SIA.

Deployment of 5G radio networks presents a broad range of opportunities as 5G millimeter wave technology and frequency ranges evolve. While 5G and 5G millimeter wave networks are being deployed now, this deployment is still in the early stages, and

swift action can create a sustainable competitive advantage.

The explosive growth of internet traffic driven by 5G is also creating a demand for high speed optical networks, and the development of integrated silicon photonic devices will be critical to this next phase of network infrastructure. Some of the proposed network architectures create denser and higher data rate networks by moving pieces of the network to centralized data centers. In such a case, there is an even greater increase in network data traffic, as data is moved from cellular towers to the core data center for processing.

It is further essential to lay the groundwork to extend beyond 5G, both for terrestrial 6G networks as well as satellite and low earth orbit communications networks. For radio frequency devices needed in both of these cases, operation in the 50GHz to 1 Terahertz regime will be a key part of the next generation of wireless networks. Innovation of devices in the 100GHz to 1Terahertz regime was identified as a critical need in the most recent “decadal plan: issued by the Semiconductor Research Corporation (SRC). The FCC has recently issued a notice of proposed rule making (NPRM) in the 70/80/90GHz bands which will accelerate commercial activity in these frequency bands.

Swift action to create leadership in 5G technology has ramifications far beyond communications networks. Leadership above 100GHz will further accelerate advanced radar, biosensing and gesture recognition for consumer, industrial and automotive applications to name a few.

Line of Effort One: Facilitate Domestic 5G Rollout

Question 1: *How can the United States (U.S.) Government best facilitate the domestic rollout of 5G technologies and the development of a robust domestic 5G commercial ecosystem (e.g., equipment manufacturers, chip manufacturers, software developers, cloud providers, system integrators, network providers)?*

Response 1: Critical to the domestic rollout and supply of 5G is a robust domestic semiconductor manufacturing sector providing differentiated technologies and the ecosystem to produce radio frequency components in the 10GHz to 100GHz regime and 100GHz to 1 THz for 6G networking. Critical to these high frequency technologies is not only a source of the core semiconductor technology, but also significant investment in 3D/heterogeneous packaging and test capabilities. Specifically, the US Government can facilitate this by:

- Incentivizing domestic semiconductor foundries and to expand technology research and development and capacity for critical RF and optical semiconductor materials and devices. Provide incentives for foundries with domestic and international capacity to advance the state of the art technology, and additionally

- to repatriate critical RF and optical process technology to the US.
- Incentivizing domestic suppliers in the development and manufacturing of critical 2D and 3D packaging solutions including antenna-in-package in support of >57GHz applications
- Incentivize domestic suppliers in the development of RF and high speed optical testing methods and solutions including over-the-air testing and leverage domestic supply chains.
- Incentivize US companies to use domestic suppliers of critical capital equipment, software and semiconductor manufacturing
- Create a public private partnership to allow universities and start up companies to gain access to critical optical and RF domestic semiconductor wafer fabrication
- Create a robust supply chain starting from wafer raw material supplier to manufacturing in order to bring technologies quickly to market

Question 2: *How can the U.S. Government best foster and promote the research, development, testing, and evaluation of new technologies and architectures?*

Response 2: The US Government can foster and promote research, development, testing and evaluation of new technologies and architectures by:

- Providing US universities and start-up companies with incentives to prototype new designs products using domestic semiconductor manufacturing
- Creating and supporting public-private partnerships centered on 6G and high speed optical networking

Question 4: *What areas of research and development should the U.S. Government prioritize to achieve and maintain U.S. leadership in 5G? How can the U.S. Government create an environment that encourages private sector investment in 5G technologies and beyond? If possible, identify specific goals that the U.S. Government should pursue as part of its research, development, and testing strategy.*

Response 4: As part of it's strategy to prioritize to achieve and maintain US leadership in 5G, the US Government should focus on the following key areas:

- Semiconductor radio frequency (RF) device technologies for 50GHz to 1 THz. The SRC decadal plan has already identified this as a critical area for investment in research and development.
- Heterogeneous packaging and testing of radio frequency products at >50GHz. It is essential that the US has domestic 3D assembly and test capability for circuits and products in the 50GHz to 1THz regime. Integrated antenna-in-package solutions are also essential for supporting direct-to-antenna architectures where high levels of integration and low cost are needed.
- Incentive companies to development and manufacture RF and millimeter wave

high performance filters on-shore.

- Accelerate the release of additional spectrum for commercial terrestrial and satellite networking. Well managed spectrum is key to the future of 5G and beyond.
- Strengthening the FCC technical advisory board with active industry experts will ensure that companies have the technologies in place to aggressively pursue new spectrum.
- Making more broadband spectrum available in the mmWave and up to THz for experimental networking, such as was done in the ISM bands at 2.5, 5 and 60GHz will accelerate new networking solutions and test beds. It is critical to make sure low earth orbit communications can participate fully in any such unlicensed bands.

Line of Effort Three: Address Risks to U.S. Economic and National Security during Development and Deployment of 5G Infrastructure Worldwide

Question 1: *What opportunities does the deployment of 5G networks worldwide create for U.S. companies?*

Response 1 : The next generation of networking will extend beyond domestic networks to include heterogeneous networks encompassing wireless and satellite communications, creating the following opportunities for US companies:

- worldwide deployments of 5G networks creates opportunities for US semiconductor companies to provide hardware around the globe
- as the networks evolve to become trans-national, as in the case of low earth orbit, it would be key for the US to lead from an equipment and regulatory standpoint.

Summary

In summary, there is opportunity based on incentives and creation of proper public private partnership for the US in the following areas:

1. mmWave 5G in general and 6G (> 52GHz) in next generation of deployment:

The US needs on-shore capability and cost-effective supply for advanced semiconductor foundry processing and advanced materials such as GaN and scaled SiGe. In these new frequency ranges incentivizing 2.5 and 3D packaging and advanced testing is also critical.

2. Satellite based internet and IOT: The US needs to act swiftly to establish a regulatory environment for satellite and low earth orbit networks. US companies such as SpaceX are already leaders and action needs to be taken to accelerate this leadership. This area needs government funding and regulation as only a few companies have their

own Satellites. There is also a need for radiation tolerant, highly reliable and cost effective semiconductor technology and packaging. The cost of launching rockets is an issue where the government should come to help in having a level playing field or encouraging innovations in finding cheaper ways to launch satellites.

(3) Encourage the development of free and open networking standards, aka OPEN RAN. OPEN RAN will open the flood gate to many fast moving, innovative companies to revolutionize the networking landscape. The US is fertile ground for innovative companies as networking standards become open, as has already happened for wireless 3G/4G and 5G as well as local area networking standards such as WiFi. The advantage the US will gain is the arrival of many startups supplying network equipment to common open specs rather than designing proprietary Base stations. The US Government should incentivise these startups through support of open networking standards and to further incentivize them to use domestic sources of semiconductor technology.

We appreciate the opportunity to provide these comments and we look for to working with the Department of Commerce on ensuring the growth and rapid deployment of a vibrant 5G ecosystem. Please contact me at bami.bastani@globalfoundries.com if you have any questions.