

mmWave Update

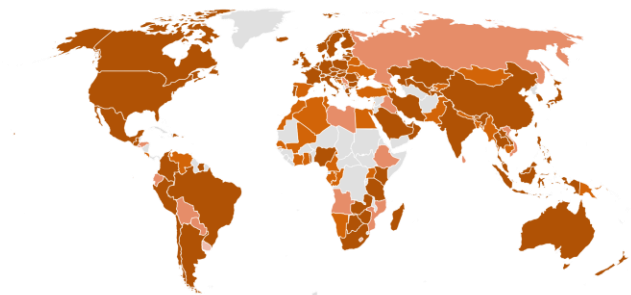
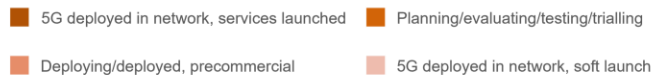
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<https://gsacom.com>

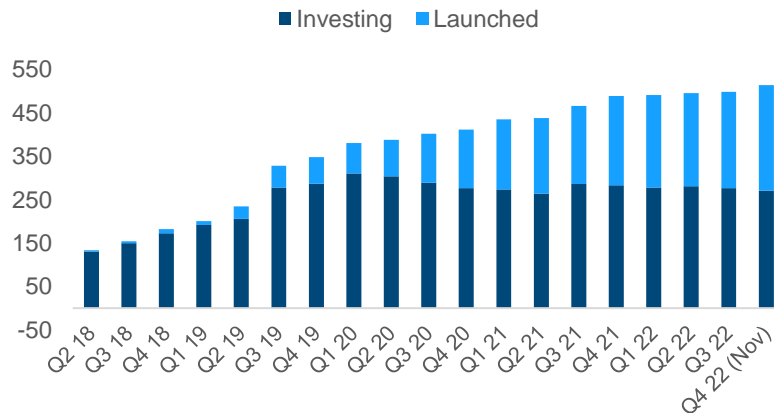
243 operators launched commercial public 5G services, in 95 countries/ territories

- As of Dec '22 **514** operators in **155** countries/territories investing in 5G networks in the form of tests, pilots, licence acquisitions, planned and actual deployments
- Of those, **243** operators in **95** countries/territories have launched commercial 3GPP-compatible 5G services (either mobile or FWA)
- **112** operators are identified as investing in 5G standalone for public networks (including those evaluating/testing, piloting, planning, or deploying as well as those that have launched 5G SA networks).
- GSA has catalogued **37** operators as having deployed/launched 5G standalone in public networks

Operator investment 5G status – most advanced status per country/territory



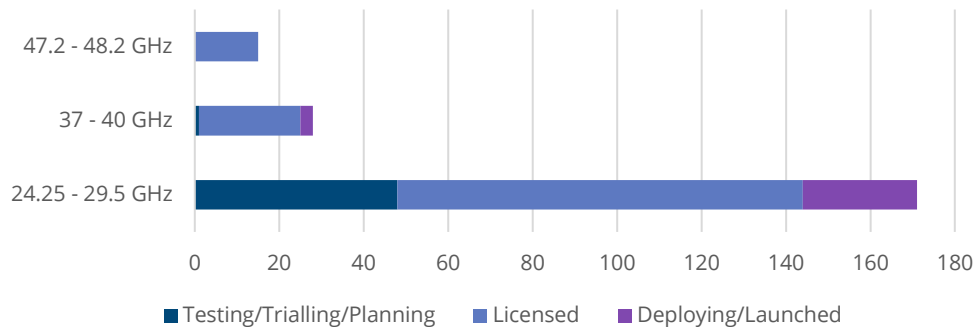
Count of operators investing in 5G, and operating commercial 5G networks



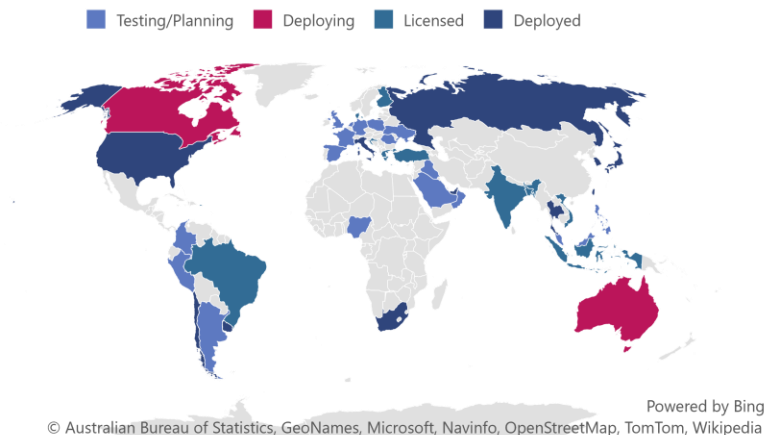
mmWave rollout is happening too

- 196 operators in 50 countries/territories have been investing in 5G mmWave (testing, trialling, planning, acquiring licences, deploying, or operating networks)
 - 26/28 GHz
 - 37-40 GHz
 - 47-48 GHz
 - Plus historically some trials at 66-76 GHz and 81-86 GHz
- 118 operators in 25 countries/territories hold licences enabling mmWave deployment in one of 26/28 GHz, 37-40 GHz and 47-48 GHz
- 28 operators in 16 countries identified as actively deploying/launched mmWave spectrum for 5G

Count and status of operator mmWave investments



Use of 5G spectrum between 24.25 GHz and 29.5 GHz

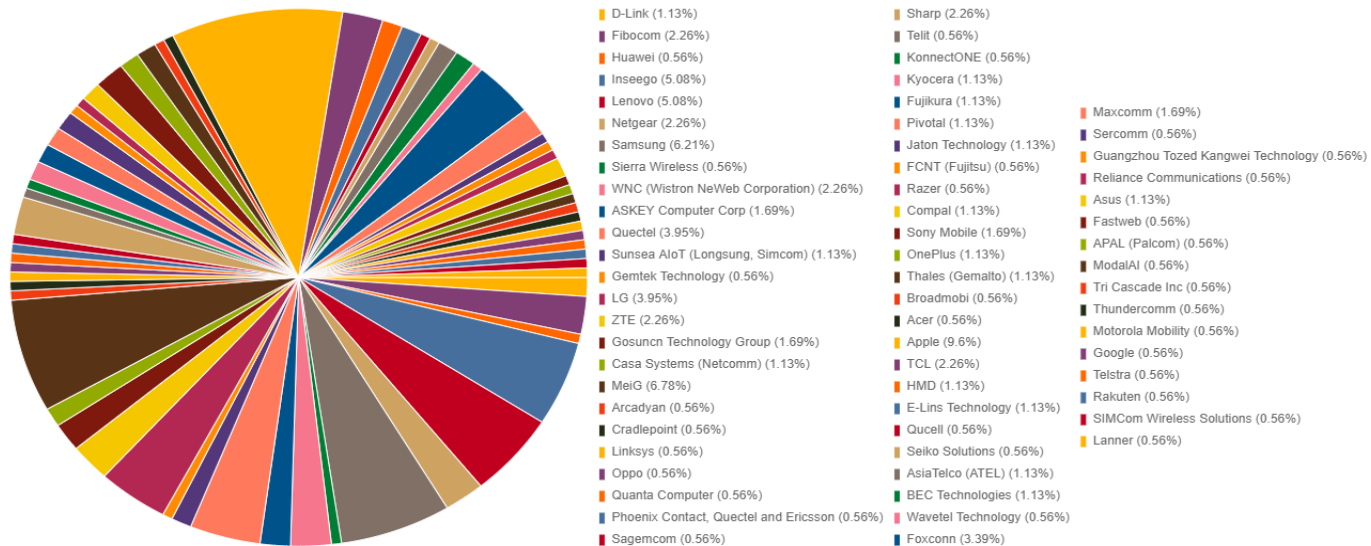


The mmWave device range is growing

Announced 5G mmWave devices Any mmWave: 177

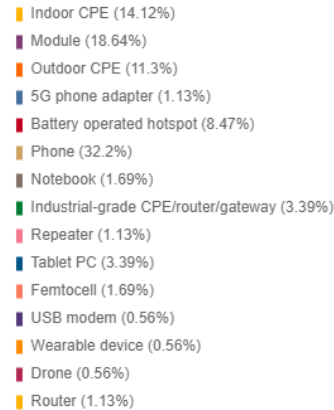
10.5% of all announced 5G devices Commercially available: 127 devices

Announced 5G mmWave devices

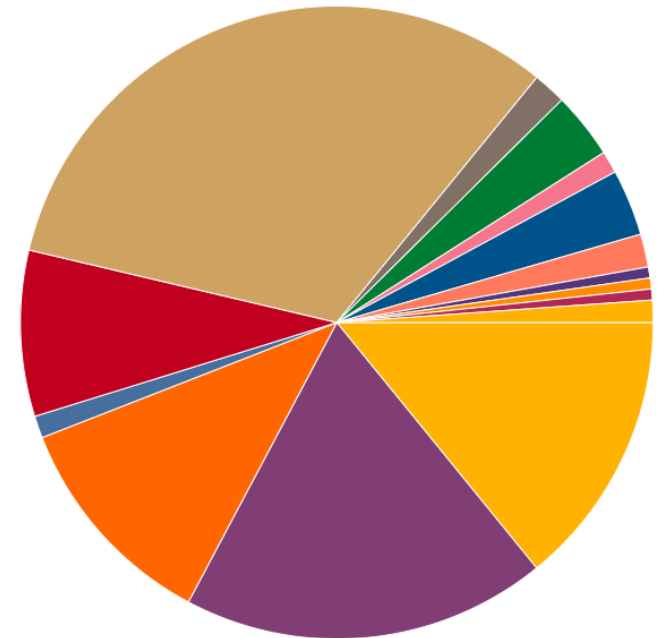


Strong vendor ecosystem emerging

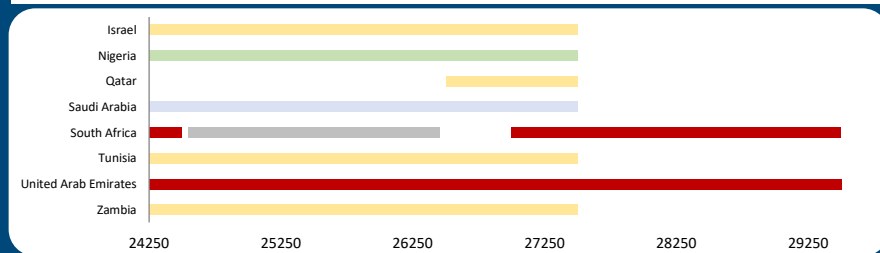
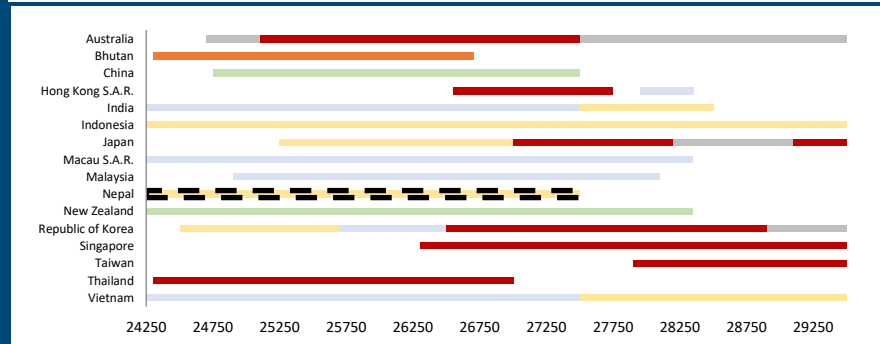
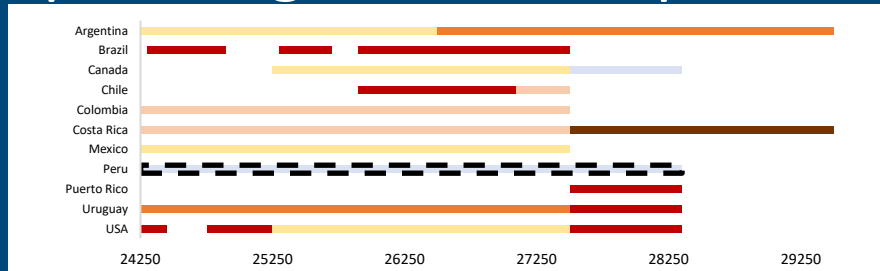
- 66 vendors have announced mmWave devices
- Announced / available
 - Any mmWave: 177
 - n257 (26.5-29.5 GHz): 52
 - n258 (24.25-27.5 GHz): 48
 - n260(27.5-28.35 GHz): 91
 - n261 (37-40 GHz) : 92
- Supported by mmWave chips from five vendors
- Indoor and outdoor CPE over 25% of all announced devices
- Phones 32% of all announced models
- Commercially available: 127 devices
 - 54 of which are phones
 - mmWave devices 9.5% of all commercial devices.



Announced 5G mmWave devices by form factor



Many more countries/territories are considering or planning mmWave spectrum assignment



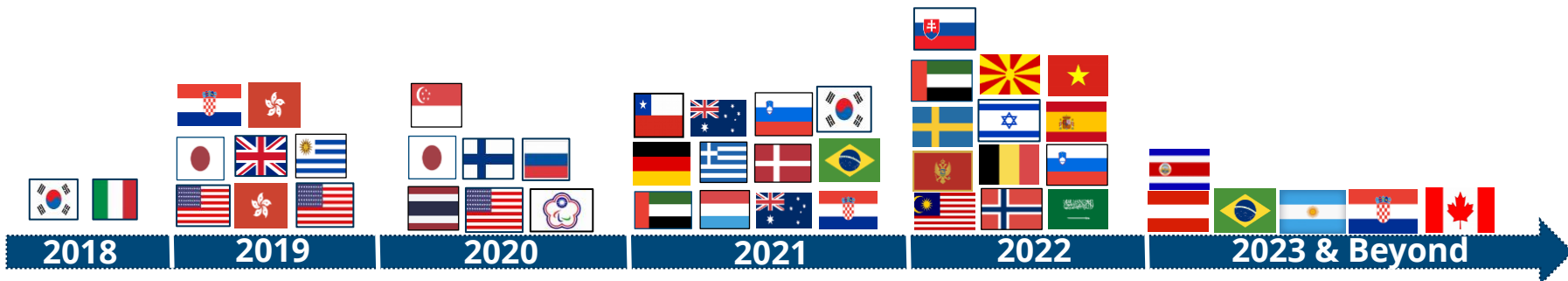
■ Assigned* ■ Ongoing assignment* ■ Reserved for future assignment* ■ Planned assignment*
 ■ Local licensing** ■ Local licensing - multi tier*** ■ Ongoing consultation ■ Considering the options
 - - - - - Precise range is Unknown ■ Temporarily assigned to test/trial ■ Planned assignment - local licensing **
 ■ Shared spectrum (indoor use) ■ Shared spectrum (indoor use) planned ■ Identified for IMT

In many countries there are existing non-5G licences that are due for expiry within a few years. These are not shown on the charts.
 * Nationwide or regional individual licensing for MNOs' public networks
 ** Spectrum set aside for individual licensing on a local basis for 5G private networks
 *** Spectrum set aside for multi-tier approach (including individual assignment on a local basis and license-exempt)

5G licensing – high ‘mmWave’ bands

(within 24.25-29.5GHz range)

- High Bands mmWave licensing (in addition to mid bands) global momentum building
 - 196 operators in 50 countries/territories have been investing in 5G mmWave (testing, trialling, planning, acquiring licences, deploying, or operating networks)
 - 118 operators in 25 countries/territories hold licences enabling mmWave deployment in one of these bands
 - 28 operators identified as actively deploying/launched mmWave spectrum for 5G in 16 countries/territories
- Leading countries/territories licensing mmWave in addition to mid and low bands
- Many countries looking at making some spectrum within the range 24.25-29.5 GHz available
- 40 GHz (37.5-43.5 GHz) range also gradually emerging (USA auctioned, CEPT developing regulatory framework)



Summary

- Commercial deployments & licensing underway are ongoing globally
- 5G ecosystem in place & expanding
- Infrastructure, chipsets & devices available and market growing
- Number of devices and infrastructure is expected to grow with the deployment of mmWave by operators
- Licensed spectrum from low, mid and high bands enables the full 5G vision
- GSA supports ASEAN countries to roll out 5G, including mmWave spectrum, and recommends to consider individual wide-area/national licensing in 2022

Global mobile Suppliers Association

The Industry Voice of the Global
Mobile Ecosystem

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