



FirstNetTM



FirstNet Device Demo Information

Rugged Smartphones:



- Sonim XP7 (AT&T Variant)
 - Deployed: JerseyNet Trial Only: Harris County, New Mexico, LA-RICS, Adcom
- Bittium Tough Mobile (Device group purchase)
 - Trial Only: Harris County
- Motorola Solutions LEX L10 (Verizon Variant)
 - Trial Only: Harris County



In Vehicle Routers:

- Sierra Wireless (InMotion) oMG2000 (Verizon + B14)
 - Deployed: Harris County (Brazos County area)
- Motorola Solutions VML-750 (Verizon)
 - Deployed: Harris County, LA-RICS



Other Devices Planned

Other priority devices to acquire for lab support include:

- CalAmp In Vehicle Router (also rebranded by Harris)
 - Deployed: JerseyNet (Harris), Adcom (CalAmp)
- Bittium Tough Mobile (Engr build to support logging)
 - Phone with engineering debug build required for lab support
- Sierra Wireless MC7354 Modem Module with Development Kit
 - Module provides commercial band support for Sierra Wireless, Motorola, CalAmp, Cradlepoint in vehicle Routers
- Cradlepoint dual modem In Vehicle Router



Band 14 Device Availability



 - Devices Acquired for FirstNet Lab Support

In Vehicle Routers:



Sierra Wireless: OMG2032
Available, band 14 **NOT**
PTCRB certified



Motorola VML700
Discontinued, certified



Motorola VML750
Available, certified



Cradlepoint IBR1100
Available Oct 6, band 14 **NOT**
PTCRB certified



Cal Amp Fusion (Harris MBC200)
Available, band 14 **NOT** PTCRB certified



Sierra Wireless: MG90
Available, band 14 **NOT** PTCRB certified

MDTs/Tablets:



Harris RF-3590
Discontinued, not certified



Motorola MW810
Discontinued, **NOT** PTCRB certified

Smartphones:



Motorola LEX700
Discontinued, **NOT** PTCRB certified



Bittium Tough Mobile (Harris LMC-1000)
Available, certified



Sonim XP7
Available, certified



Motorola LEX L10
Available, certified

Modems & Specialized:



Harris PBM--214
Availability?



Harris XL-200P
Pre-commercial for LTE support



Motorola APX7000L
Available, certified, limited LTE functionality



Cassidian MPC14
Discontinued, certified



Motorola UMB1000
Discontinued, not certified



General Dynamics AMW



Sequans LM 63S1
Custom design – not commercially available, certified

Available, band 14 **NOT** PTCRB Certified

- Qualcomm QXDM – “Qualcomm eXtensible Diagnostic Monitor”

- Log collection tool for Qualcomm based devices
 - All current lab devices have Qualcomm based LTE modems
- Collects binary logs composed of items
- Device must be configured to support a diagnostics port
- FirstNet has a single network based license



- Qualcomm QCAT –

- Log post processing tool to decode, display, plot and export binary logs generated by QXDM
- FirstNet has a site license for this tool

Each chipset has a dependency on logging tools:

- Qualcomm – Tool support: QXDM, Linkmaster, Accuver, Viavi
 - All lab devices have Qualcomm chipsets
- Sequans – Tool Support: Accuver
 - Used in Motorola VML-750 for band 14 support
- Altair – Tool Support: Linkmaster, Accuver
 - Used in Sierra Wireless, CalAmp, Cradlepoint IVRs for band 14 support
- Samsung – Tool Support: Accuver, Viavi
 - Leading chipset platform for support of ProSe and MCPTT
- Intel – Tool Support: Accuver

The device group is investigating the best option for a logging tool with broad chipset support.

- Rohde & Schwarz CMW-500 Bench Top Tester
 - Bench top test box supporting key public safety services
 - RF performance testing
 - End to end data performance testing
 - IMS support of VoLTE, Messaging, RCS, Video over LTE
 - Future support of ProSe and MCPTT
 - CMWRun – Automated RF test tool
 - CMWCards – Test script development tool



LTE Signaling Analysis



- Example of LTE Attach/Detach Over The Air Messages

QCAT - C:\Users\bleitch\Documents\Device Test\Logs\08222016\attach and detach 1 08-22-12-58.isf

File Edit View Analysis Tools Window Help

#	Time	Type	Description	Subtitle	Direction	Size	Subsc
63917	2016 Aug 22 18:56:00.060	0xB0ED	LTE NAS EMM Plain OTA Out...	Detach request Msg	BS <<< MS	37	
90599	2016 Aug 22 18:57:00.885	0xB0ED	LTE NAS EMM Plain OTA Out...	Attach request Msg	BS <<< MS	127	
92368	2016 Aug 22 18:57:01.048	0xB0EC	LTE NAS EMM Plain OTA Inco...	Identity request Msg	BS >>> MS	19	
92411	2016 Aug 22 18:57:01.048	0xB0ED	LTE NAS EMM Plain OTA Out...	Identity response Msg	BS <<< MS	33	
92753	2016 Aug 22 18:57:01.105	0xB0EC	LTE NAS EMM Plain OTA Inco...	Authentication request Msg	BS >>> MS	52	
94231	2016 Aug 22 18:57:01.510	0xB0ED	LTE NAS EMM Plain OTA Out...	Authentication response Msg	BS <<< MS	33	
94766	2016 Aug 22 18:57:01.610	0xB0EC	LTE NAS EMM Plain OTA Inco...	Security mode command Msg	BS >>> MS	27	
94862	2016 Aug 22 18:57:01.611	0xB0ED	LTE NAS EMM Plain OTA Out...	Security mode complete Msg	BS <<< MS	35	
95664	2016 Aug 22 18:57:01.740	0xB0E2	LTE NAS ESM Plain OTA Inco...	ESM information request Msg	BS >>> MS	19	
95682	2016 Aug 22 18:57:01.741	0xB0E3	LTE NAS ESM Plain OTA Outg...	ESM information response Msg	BS <<< MS	39	
97096	2016 Aug 22 18:57:01.875	0xB0EC	LTE NAS EMM Plain OTA Inco...	Attach accept Msg	BS >>> MS	114	
97101	2016 Aug 22 18:57:01.875	0xB0E2	LTE NAS ESM Plain OTA Inco...	Activate default EPS bearer context re...	BS >>> MS	101	
98209	2016 Aug 22 18:57:01.879	0xB0ED	LTE NAS EMM Plain OTA Out...	Attach complete Msg	BS <<< MS	29	
136016	2016 Aug 22 18:57:07.669	0xB0ED	LTE NAS EMM Plain OTA Out...	Detach request Msg	BS <<< MS	37	
159413	2016 Aug 22 18:57:15.925	0xB0ED	LTE NAS EMM Plain OTA Out...	Attach request Msg	BS <<< MS	127	
161970	2016 Aug 22 18:57:16.259	0xB0EC	LTE NAS EMM Plain OTA Inco...	Identity request Msg	BS >>> MS	19	
161983	2016 Aug 22 18:57:16.259	0xB0ED	LTE NAS EMM Plain OTA Out...	Identity response Msg	BS <<< MS	33	
163623	2016 Aug 22 18:57:16.623	0xB0EC	LTE NAS EMM Plain OTA Inco...	Authentication request Msg	BS >>> MS	52	
165383	2016 Aug 22 18:57:17.030	0xB0ED	LTE NAS EMM Plain OTA Out...	Authentication response Msg	BS <<< MS	33	
176037	2016 Aug 22 18:57:27.985	0xB0ED	LTE NAS EMM Plain OTA Out...	Attach request Msg	BS <<< MS	127	
177641	2016 Aug 22 18:57:28.170	0xB0EC	LTE NAS EMM Plain OTA Inco...	Identity request Msg	BS >>> MS	19	
177654	2016 Aug 22 18:57:28.170	0xB0ED	LTE NAS EMM Plain OTA Out...	Identity response Msg	BS <<< MS	33	
178097	2016 Aug 22 18:57:28.249	0xB0EC	LTE NAS EMM Plain OTA Inco...	Authentication request Msg	BS >>> MS	52	
179578	2016 Aug 22 18:57:28.655	0xB0ED	LTE NAS EMM Plain OTA Out...	Authentication response Msg	BS <<< MS	33	
180195	2016 Aug 22 18:57:28.778	0xB0EC	LTE NAS EMM Plain OTA Inco...	Security mode command Msg	BS >>> MS	27	
180289	2016 Aug 22 18:57:28.779	0xB0ED	LTE NAS EMM Plain OTA Out...	Security mode complete Msg	BS <<< MS	35	

Packet Text

Hex Dump

```
2016 Aug 22 18:57:00.885 [00] 0xB0ED LTE NAS EMM Plain
pkt_version = 1 (0x1)
rel_number = 9 (0x9)
rel_version_major = 5 (0x5)
rel_version_minor = 0 (0x0)
security_header_or_skip_ind = 0 (0x0)
prot_disc = 7 (0x7) (EPS mobility management message)
msg_type = 65 (0x41) (Attach request)
lte_emm_msg
  emm_attach_request
    tsc = 0 (0x0) (cached sec context)
    nas_key_set_id = 3 (0x3)
    att_type = 2 (0x2) (combined EPS/INSI attach)
    eps_mob_id
      id_type = 6 (0x6) (GUTI)
      odd_even_ind = 0 (0x0)
      GutI_1111 = 15 (0xf)
      ncc_1 = 0 (0x0)
      ncc_2 = 0 (0x0)
      ncc_3 = 1 (0x1)
      anc_3 = 15 (0xf)
      nnc_1 = 0 (0x0)
      nnc_2 = 1 (0x1)
      MME_group_id = 8 (0x8)
      MME_code = 10 (0xa)
      n_tmsi = 3196875589 (0xbe8c7345)
    ue_netwk_cap
      EEA0 = 1 (0x1)
      EEA1_128 = 1 (0x1)
      EEA2_128 = 1 (0x1)
      EEA3_128 = 0 (0x0)
      EEA4 = 0 (0x0)
      EEA5 = 0 (0x0)
      EEA6 = 0 (0x0)
      EEA7 = 0 (0x0)
      EIA0 = 0 (0x0)
      EIA1_128 = 1 (0x1)
      EIA2_128 = 1 (0x1)
      EIA3_128 = 0 (0x0)
      EIA4 = 0 (0x0)
      EIA5 = 0 (0x0)
```

Document with Full Decode of Attach Message



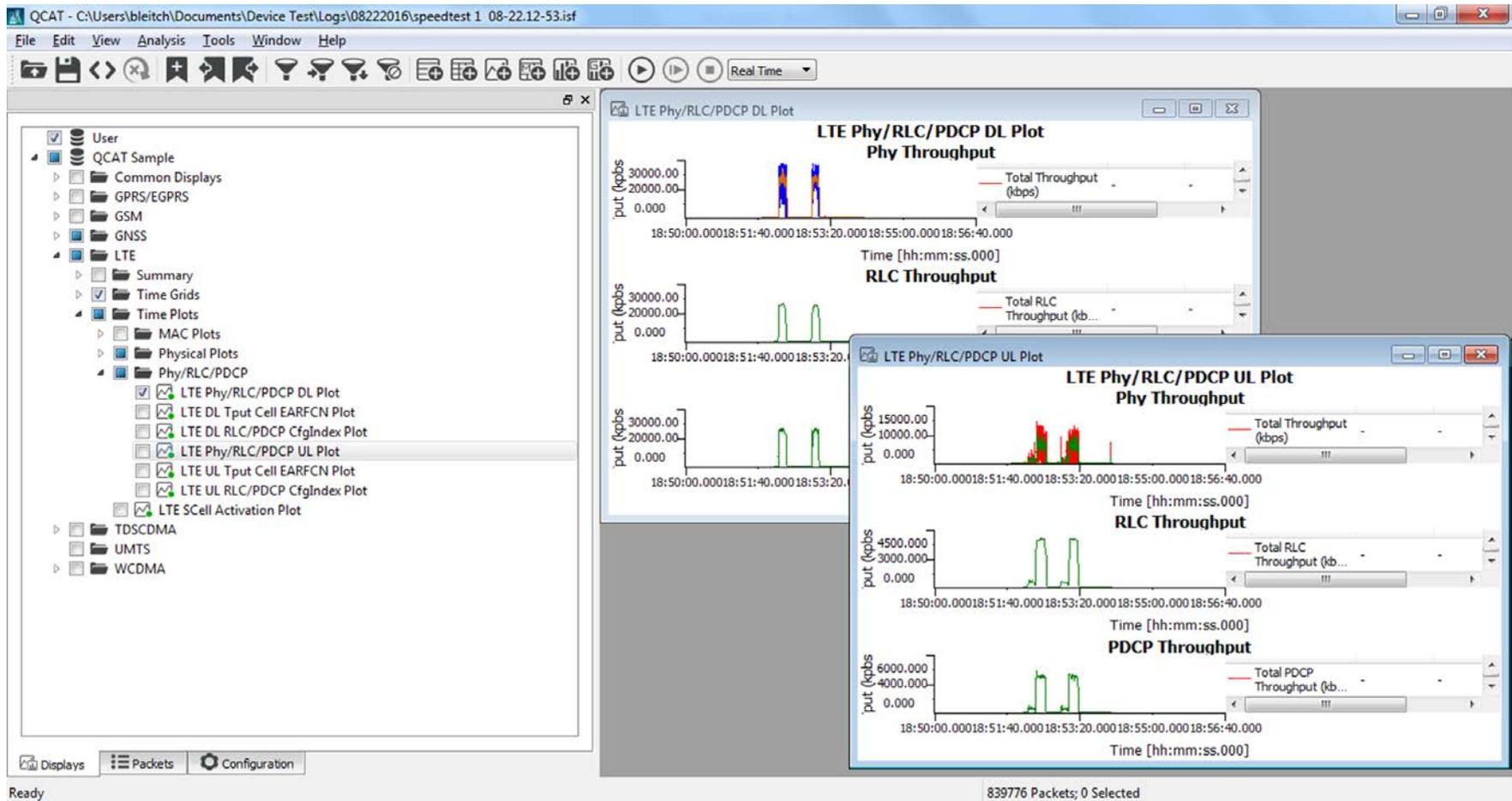
Microsoft Word Document

369995 Packets; 1 Selected

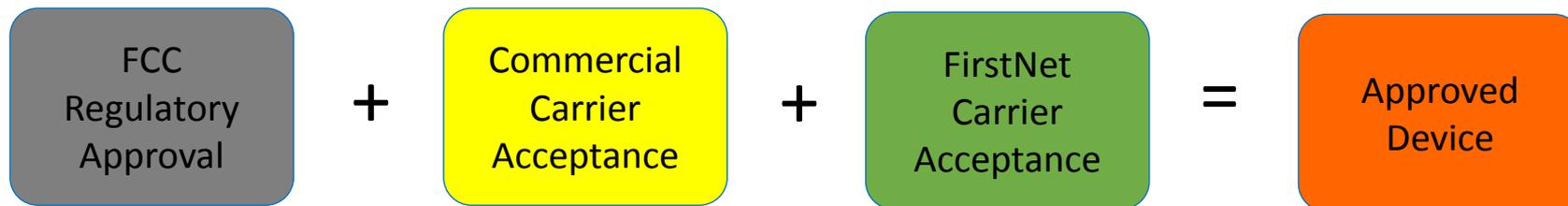
Data Performance Analysis



- Example Plots of Downlink and Uplink Speedtest Data



High Level Process Leading to an Approved Device



- FCC Regulatory Approval is the minimum testing that must be performed on a device before it can be sold in the United States.
- Commercial Carrier Acceptance is the process employed by a commercial MNO to ensure that a device containing commercial LTE bands meets 3GPP specifications and any additional requirements unique to the MNO.
- FirstNet Carrier Acceptance is the process employed by FirstNet to ensure that a device containing LTE B14 meets 3GPP specifications and public safety specific requirements.
- The output of the above processes yields a device that is approved for the FirstNet B14 network and the commercial bands supported by an MNO(s).