

Minutes  
Multi-Gigabit Automotive Optical PHY Study Group (OMEGA)  
12-13 November 2019

Attendees

| <b>Name</b>          | <b>Employer</b>                | <b>Affiliations</b>                      |
|----------------------|--------------------------------|--|
| Ankararaman, Sandeep | Rosneberger                    | Rosneberger                              |
| Aono, Michikazu      | Yazaki                         | Yazaki                                   |
| Audrae, Stefan       | SEI Autech-Europe GmvH         | SEI Autech-Europe GmvH                   |
| Bober, Kai Lennert   | Fraunhofer                     | Fraunhofer                               |
| Boyer, Rich          | APTIV                          | APTIV                                    |
| Carlson, Steve       | HSD                            | Marvell, Bosche                          |
| Choudhury, Mabud     | OFS                            | OFS                                      |
| DiBiaso, Eric        | TE Connectivity                | TE Connectivity                          |
| Eyal, Massad         | Valens                         | Valens                                   |
| Goto, Hideki         | Tyota Motor Corporation        | Tyota Motor Corporation                  |
| Grow, Robert         | RMG Consulting                 | RMG Consulting, KDPOF                    |
| Gubaw, Marty         | Keysight                       | Keysight                                 |
| HIRASE, Hidenari     | AGC                            | AGC                                      |
| Hyakutake, Yasuhiro  | Adamant Namiki Precision Jewel | Adamant Namiki Precision Jewel           |
| Jackson, Kenneth     | Sumitomo                       | Sumitomo                                 |
| Jaramillo, Jesse     | Amphenol Corp                  | Amphenol Corp                            |
| Kadry, Haysam        | Ford Motor Company             | Ford Motor Company                       |
| KAGAMI, Manabu       | NI Tech                        | NI Tech                                  |
| KIKUTA, Tomohiro     | Adamant Namiki Precision Jewel | Adamant Namiki Precision Jewel           |
| KIM, Kihong          | Hirose USA                     | Hirose USA                               |
| Kondo, Taiji         | Megachips                      | Megachips                                |
| Kumada, Taketo       | YAZAKI                         | YAZAKI                                   |
| Kurata, Kazuhiko     | AIO Core                       | AIO Core                                 |
| Lackner, Hans        | QoSCom                         | QoSCom                                   |
| LIU, Hai-Feng        | H G Genuine                    | H G Genuine                              |
| Madgar, Zahv         | Valens                         | Valens                                   |
| MASUDA, Takeo        | OITDS/PETRA                    | OITDS/PETRA                              |
| Murthy, Ramana       | Broadcom                       | Broadcom                                 |
| Nevux, Paul          | Superior Essex                 | Superior Essex                           |
| Niihara, Yoshihiro   | Fujikura                       | Fujikura                                 |
| Ogura, Ichiro        | PETRA                          | PETRA                                    |
| Pardo, Carlos        | KDPOF                          | KDPOF                                    |
| Pérez-Aranda, Rubén  | KDPOF                          | KDPOF                                    |
| Pimpinella, Rick     | Panduit                        | Panduit                                  |
| Pitwon, Richard      | Resolute Photonics             | AIO CORE                                 |
| Raju, Parthasarathy  | Tektronix                      | Tektronix                                |
| Shigematsu, Masayuki | Sumitomo Electric              | Sumitomo Electric                        |
| Shiino, Matsato      | Furukawa Electric              | Furukawa Electric                        |
| SORBARA, Massimo     | Global Foundries               | Global Foundries                         |
| Sparrowhawk, Bryan   | Leviton                        | Leviton                                  |
| Swanson, Steve       | Corning Inc.                   | Corning Inc.                             |
| Takahashi, Satushi   | POF Promotion                  | POF Promotion                            |
| Takahashi, Tadashi   | Nitto Denko Corp.              | Nitto Denko Corp.                        |
| Takayama, Kazuya     | Nitto Denko Corp.              | Nitto Denko Corp.                        |
| Thompson, Geoff      | GraCaSi SA                     | Independent                              |
| Vanderlaan, Paul     | UL LLC                         | UL LLC                                   |
| Wang, Alvin          | Huawei                         | Huawei                                   |
| Wienckowski, Natalie | General Motors                 | General Motors                           |
| Zhu, Chunhui         | Futurewei                      | Futurewei                                |
| Zimmerman, George    | CME Consulting                 | APL, GP-ADI, BMW, Cisco, Marvell, SemTek |

**Tuesday, 12 November 2019, 13:00**

Mr. Robert Grow, Study Group Chair called the meeting to order. No one responded to the request to act as Recording Secretary for the meeting, so Mr. Grow recorded these minutes. Attendees were asked to introduce themselves noting their employer and any other affiliations.

Mr. Grow presented the agenda.

### **Motion 1**

Approve the agenda:

M: S. Swanson

S: R. Pitwon

Procedural. Approved by voice without objection.

### **Motion 2**

Approve the September 2019 study group minutes.

M: R. Perez-Aranda

S: K. Jackson

Procedural. Approved by voice without objection.

Mr. Grow then reviewed the general tasks to be performed in a Study Group and expectations of participants (“Agenda and General Information” presentation). This presentation included review of the slides Guidelines for IEEE SA meetings, IEEE SA Copyright Policy and Participation in the Individual Process (which now replaces the Participation in IEEE 802 slide).

The list of presentations was updated adding a late presentation. Discussion on the SG target for January 2020 interim approval of PAR, CSD and Objectives for submission to the March 2020 LMSC plenary meeting was reviewed. We are now committed to

Mr. Pérez-Aranda presented “GaAs 14G VCSEL characterization for automotive applications” and responded to questions. The presentation described testing of possible VCSEL devices for use in multi-gigabit automotive applications.

Mr. Pérez-Aranda presented “InGaAs 25G VCSEL characterization for automotive applications” again focusing on possible VCSEL devices. Test results indicate that 25 Gb/s operation is within the capabilities of current technologies. In response to questions, there is evidence that lab testing presented was NRZ, but other testing supported limited multi-level signaling. Testing to date indicates the VCSEL devices work with 4 levels but will not work with 16 levels.

Mr. Pérez-Aranda’s next presented “VCSEL Simulation model”, indicating he believed the simulation was important to correlate with test results to build confidence on VCSEL technology operating over the complete range of automotive requirements.

Mr. Ichiro Ogura presented “Introduction of SI Photonics transceiver technology with High temperature operation capability and MMF transmission” and responded to questions.

Kazuya Takayama presented “Evaluation of the Link Loss Budget of the POF”. Discussion followed with some comparison to glass optics.

Mr. Pérez-Aranda presented “Link budget analysis for technical feasibility assessment”. Discussion and questions followed.

Morning, afternoon, and lunch breaks were taken during the day. The SG recessed for the day at approximately 17:00.

### **Wednesday, 13 November 2019, 08:30**

Mr. Grow called the meeting to order. Presentations continued.

Mr. Choudhury presented “Glass Optical Fibers for Automotive”, focusing on available technology from other harsh environment applications like aviation.

Mr. Swanson presented “Fiber Components for Optical Automotive”. Extensive discussion followed on various component technologies.

With permission of the group, a presentation was added. Mr. Zimmerman had presented on a topic of interest to the Greater than 10 Gb/s Study Group, and was invited to present the presentation to this group because of its relevance to asymmetric traffic rates.

Mr. Pardo presented proposals for project objectives, "Draft Objectives OMEGA". Significant discussion ensued on some proposed objectives with refinements suggested. Straw polls were taken on objectives. (Counts were not taken, the polls were only to get a sense of what participants thought, abstains were not asked for only judged by folk on the stand. Please refer to the presentation for specific wording of proposed objectives.)

The basic objectives of support for Ethernet frame, minimum and maximum frame sizes, and full duplex operation were unanimous. The proposed startup time objective was well supported without opposition.

The auto-negotiation objective straw poll had abstains strongly winning, some comments indicated we could add such an objective later if a need arose. An Energy Efficient Ethernet objective was well supported with some abstentions.

The proposed automotive environments and EMC/FCC/CISPR objectives were supported without opposition.

There was extensive discussion on MAC data rates to be supported by PHYs we would specify. The rate, reach and number of connector objectives for 2.5 Gb/s, 5 Gb/s, 10 Gb/s and 25 Gb/s were not opposed, with a small increase in people not indicating either yes or no at 25 Gb/s.

The 50 Gb/s data rate engendered significant discussion, including whether the objective should specify number of connectors or reach numbers. The proposed objective (with TBD reach and connector numbers) was strongly supported.

It was noted that 100 Gb/s has not been supported by any presentations. 200 Gb/s and 400 Gb/s proposed objectives were removed. 100 Gb/s (with TBD reach and connectors) was supported assuming presentations would be forthcoming.

The general bit error ratio objective of  $10^{-12}$  or better was also supported

Mr. Grow displayed a draft PAR and then went into discussion of the "Major PAR fields" contained in that PAR. The original presentation had some text highlighted that could be required if scope expands to include hybrid links. The displayed PAR (updated post meeting for inclusion on the web site for January) allowed discussion of number of participants. Mr. Grow indicated PAR update could be done in January if required.

Mr. Pardo proposed responses to the Criteria for Standards Development (CSD), "Draft CSD". Suggestions for improvement were made by members of the SG and edited into the draft during group discussion. The CSD responses were generally agreeable to the SG and form a good basis for refinement and approval in January.

Mr. Grow invited a motion to request re-chartering (extension) of the SG:

Motion 3

Move that the IEEE 802.3 Working Group request the re-chartering of the Multi Gigabit Automotive Optical PHYs Study Group.

M: C. Pardo , S: R. Pitwon

Y: 24, N: 0, A: 0

Mr. Grow asked if there was any other business. He reviewed future meetings, thanked the participants, and having reached the end of the agenda invited a motion to adjourn.

Motion 4

Move to adjourn.

M: S. Swanson

S: R. Pitwon

Procedural. Approved by voice without objection.

The meeting was adjourned at approximately 17:05.