**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | **TG4q ULP May 2013 Meeting Minutes** | |
| Date Submitted | 23 May 2013 | |
| Source | [Jinesh Nair] [Samsung.] | E-mail:[jinesh.p@samsung.com] |
| Re: | Ultra Low Power amendment to IEEE 802.15.4 | |
| Abstract | TG4q ULP Meeting minutes | |
| Purpose | Meeting minutes | |
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**Task Group ULP Meeting Tuesday, 14 May 2013**

**AM1 session:**

1. Chair (Shahriar Emami) called session to order at 08:10 am.

2. Opening report (DCN: 15-13-0310-00-004q) for ULP presented by Chair

3. March meeting minutes (DCN: 15-13-0284-01-004q) is approved

Motion to approve the meeting minutes passed anonymously

Moved by: Steve (Semtech)

Seconded by: Allan (Samsung)

4. ULP Agenda (DCN: 15-13-0309-01-004q) presented by the Chair

**5. Activity, discussions and rework related to the TGD draft (DCN: 15-13-0233-01-004q) followed**

Each of the technical parameters listed in the TGD draft were taken up for discussion. The parameters discussed in this session were the range, data rate, symbol/chip rate, modulation/coding, synchronization and timing. The following are the main points taken up during the discussion.

5.1. Range:

*Ed:* It is not required to include this parameter. The range addressed by the proposal should be an outcome of the other parameters like the transmit power, receiver sensitivity etc. and this then will indicate the applications addressed by the proposal.

*Frederik*: It is easy to address a range like 30 m in free space but things are different in the presence of fading.

*Kiran*: The range was set to 30 m based on the discussions on the applications before the last meeting. However, there were a few more presentations made on the applications for ULP in which the range is typically lesser. Hence it is advisable to reduce the range to 10 m as opposed to the minimum data rate of 30 m.

*Andy*: It is better to define the transmit power and receiver sensitivity and infer a range from these values. There is no need to explicitly mention a constraint on the range.

5.2. Bit Rate:

*Kiran:* There is no need to specify an upper limit on the data rate. The maximum data rate of 1 Mbps can be removed.

*Frederik:* It is useful to include a typical data rate instead of putting a constraint like a minimum data rate of 250 Kbps as in the current TGD draft.

*Pat:* In interference limited environments it is better to have short transmission times. Hence the guideline for bit rates should also specify the number of bits in a packet. The proposal should address the effective bit rates or equivalently, for a certain payload how much is the bit rate. The bit rates achievable in the proposal should be without any FEC and other redundancies.

*Andy:* To maintain good energy efficiency under a peak power constraint mentioned in the PAR, the optimal data rates should be around 300 Kbps to 400 Kbps (DCN: 15-13-0052-01-004q) .

Ed: The TGD document should not look like a proposal with exact figures and too specific constraints.

*Pat:* is advisable that the proposal mention which of the applications can be met and which are to be knocked off in view of the achievable bit rate.

*Kiran:* It is advisable to have some constraint on the bit rate.

*Pat:* This should come from the applications the proposal shall address.

*Jinesh:* The applications discussed so far reveal a wide range of bit rates

5.3 The technical guidance for the symbol/chip rate, modulation and coding was framed.

6. Meeting was recessed at 09:55 am.

**AM2 session**

1. Chair (Shahriar Emami) called session to order at 10:40 am.

**2. Activity, discussions and rework related to the TGD draft (DCN: 15-13-0233-01-004q) continued**

2.1 Synchronization and timing

*Andy:* Good to relate the synchronization constraints with the sensitivity level. The synchronization should include timing frequency and frame synchronization.

*Pat:* The sensitivity level should be measured for a prescribed packet length and a packet error rate. Also the accuracy should be mentioned irrespective of whether the devices are symmetric or asymmetric.

*Jinesh:* Is it not required to put a constraint on the probability of missed detection and the false alarm rate?

*Kiran:* The sensitivity level addresses this issue. The second and third sentences in the modified draft address the issue.

2.2 PHY frame structure

*Jinesh:* It is good to include the components of the PHY frame structure like the preamble, SFD payload etc. in the TGD.

*Pat:* This is going to be there anyway. No need to specifically mention this.

2.3 Transmit Power

*Chair and others:* The details for this have already been included in the range parameter.

2.4 PSD

*Chair :* The PSD is constrained by the regional spectral regulations.

*Jinesh:* The details of the adjacent channel interference rejection and the alternate channel interference rejection may be provided.

2.5 Chan availability

Pat Kinney assisted in framing the guidance for this parameter.

2.6 Sensitivity

The definition of the sensitivity, relating it to the PER for a given PSDU size and receiver noise figure was articulated.

2.9 Low Power capability

*Chair and others*: Transmit and receive powers should be specified. Both the average and peak powers need to be specified.

2.10 The guidance for the technical parameters operational bands, interoperability and co-existence were framed.

3. Meeting was recessed at 12.15 pm.

**Task Group ULP Meeting Thursday, 16 May 2013**

**AM1 session:**

1. Chair (Shahriar Emami) called session to order at 08:10 am.

**2. Jinesh P Nair presented the draft on the channel model document (DCN: 15-13-0329-01-004q)**

*Shahriar:* Editorial changes were suggested all through the document. Also some figures/plots/tabular columns giving details of the relationships of the path loss to the various parameters like distance, path loss exponent and environment could be given. Details of the simulation methodology for the small scale fading channel models and its use in system level simulations may be described in the revised draft.

*Andy:* It is good to show how these path loss models compare with the free space path loss models. Some plots could be presented. Are there any height specifications for the path loss models? It is useful to describe the method to use the channel models. Are there any statistical models for the large scale fading which could then be used to say that for a certain percentage of time the channel is going to have certain kind of characteristics? For example, the percentage of time the received signal strength is good. Please specify the references to the tabular columns in the channel models.

*Kato:* Consideration of Saleh-Valenzuela channel models to describe the ULP small scale fading channel. Are any measurement campaigns done for the channel models that are specified?

*Frederik:* Consideration of other frequency bands especially for the sub-GHz band.

*Jinesh:* All the comments will be addressed to the extent possible

3. Meeting was recessed at 9.30 am

**AM2 session:**

1. Chair (Shahriar Emami) called session to order at 10:40 am.

**2. Frederik Beer presented the document (DCN: 15-13-0322-01-004q) titled “Considerations for optimal data rates”**

*Jinesh :* What constitutes the Pbase in the equations?

*Steve:* The phase noise becomes a critical parameter limiting the performance especially in spread spectrum systems

*Ed:* The presentation relates the power received and the optimal rate. However, in the presence of interference, the power at the receiver becomes important. It is important to do this analysis from a receiver power perspective. With respect to the receiver, for short range communications, the receive power is almost flat with the data rates.

*TG SRU chair:* To understand more on the impact of interference please attend the SRU meetings

*Tohoku Univ:* Are there any models for the interference and interference management?

*Andy:* From a receive power perspective the channel filer relates to the data rate. The question to be asked is that for the applications considered for the sensor network, which power becomes more significant, the transmit power or the receive power? Also, for ultra-low power communications the leakage current becomes a dominating factor.

*Steve:* It is the receive power that dominates in asynchronous traffic typical in sensor networks. In the case of spread spectrum systems, the phase noise component determines the Pbase  of the transmit power.

4. Revision of the schedule by Bob Heile. Enquired if there are any objections to the revised schedule and found none.

3. TG4q meeting adjourned at 12.20 pm

Motion to adjourn the meeting

Moved by: Steve (Semtech)

Seconded by: Allan (Samsung)