Meeting 1
IIA Project GF3 “Audio-Modem” Standardisation Group
8 May 2020, 10 am BST

Chair: Jossy Sayir
Delegates: Kiseki Hirakawa
Shangyi Lin
Kiran Jolly
Jason Huang
Adam Goldney
Charalampos Maxoutis (standing for Tom Crossley)
Observers: Lawrence Tray
Joe Xu
Jackie Guo
Kai Junge

Agenda:

1. Agree a name for the standard (all)
2. Standardisation in communications (Jossy)
3. Audio modem parts components that need standardising (all)
4. Weekend Challenge announcement (Jossy)
5. Any other business

Minutes

1. The group and delegate names and proposals for standards were received and presented:

	Group Name	**Delegate**	**Proposed Standard Name(s)**
Group 1	CleanNoise	Kiseki Hirakawa	CAM ("CAM Audio Modem")
Group 2	6G	Shangyi Lin	wifi7
Group 3	Team Wapiti	Kiran Jolly	SCP-GF3 ("Standard Communications Protocol")
Group 4	Audiohouse	Jason Huang	CamG ("Cam Generation" like 5G)
Group 5	dangerous 5Gs	Adam Goldney	Jossy.20X
Group 6	Transmission Impossible	Tom Crossley	CamFDM

All proposals were presented by the proposers. “CAM” is a recursive acronym that stands for “CAM Audio Modem”, “wifi7” was proposed because the current generation of wifi modems is the 6th, “SCP-GF3” stands for “Standard Communication Protocol – GF3”, “CamG” is a reference to mobile standards 2G,3G,4G,5G where “G” stands for “Generation” and hence reads the “Cambridge Generation”, “Jossy.20X” is inspired by wireless standards 802.11X and composed of the lab leader name, the year and an “X” for good measure, and CamFDM hints that OFDM is being used as the underlying modulation technique. A two-pass vote was taken with one vote per delegate or chair and the proposals “CamG” and “CAM” were retained for the 2nd round. All delegates voted in the 2nd round and the chair abstained, and “CamG” was adopted as the name of our standard by 4 votes to 2.

2. Jossy described how communications standards tend to define the transmitter only and companies compete on the quality of their receiver implementations. There is a subtle game of trying to plant features in the transmitter standard that can be used by their receiver without revealing too much about their receiver to other standardisation participants. In video compression on the other hand, it is the decoder (player) that is standardised and companies compete on the quality of their video encoder / compressor. Since ours is a communications standard, we will be standardising the transmitter.
3. A discussion about the components necessary for our standard highlighted the following 4 essential parts:
    a. Modulator (OFDM symbol length(s), cyclic prefix length(s), constellation size, etc.)
    b. Channel estimator
    c. Synchronisation
    d. Error control coding

    A few interesting questions were asked in the discussion:
    - Is there a need for pulse shaping? This is an interesting question. The samples of the OFDM symbols can be forwarded directly to the sound card's D/A converter where some form of pulse shaping will be applied (but we have no control over that.) We could also reduce the rate of sample transmission and apply our own digital pulse-shaping before forwarding to the D/A converter. It is not clear whether this might improve the quality of communication and definitely something that groups should experiment with.
    - Should we use AM or FM? AM and FM are passband modulation techniques and the audio spectrum is from 20 Hz to 20 kHz, which is essentially baseband, so we are unlikely to apply AM or FM. There is one interpretation of baseband OFDM (DMT) that sees it as AM modulated regular (passband) OFDM. More about this in one of our upcoming meetings as delegates get a clearer picture about the differences between baseband and regular OFDM. One note: should we want to avoid a few lower frequencies (say start modulating only at 100 Hz rather than 20 Hz) then this is easily achieved in baseband OFDM by just assigning 0s to those frequency bands and there is no need to resort to passband OFDM.
4. A challenge will be issued to each group before the weekend, to de-modulate an OFDM modulated file. All details will be revealed on moodle. A different file is assigned to each group and each file is a hint to a (different) 5 letter word. Once the file has been de-modulated and opened, it should be fairly easy to find the 5 letter word it refers to. Please upload your 5-letter word to the moodle assignment page and I will publish a "league table" of groups in chronological order of correct submission (with groups guessing the wrong word disqualified…)
5. No other business

The meeting ended at 11 am BST.