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# **IEEE802.3aq Channel Modeling Ad-Hoc**

## **Recent Progress, Future Goals & Plans**

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# Activities to date: Overview

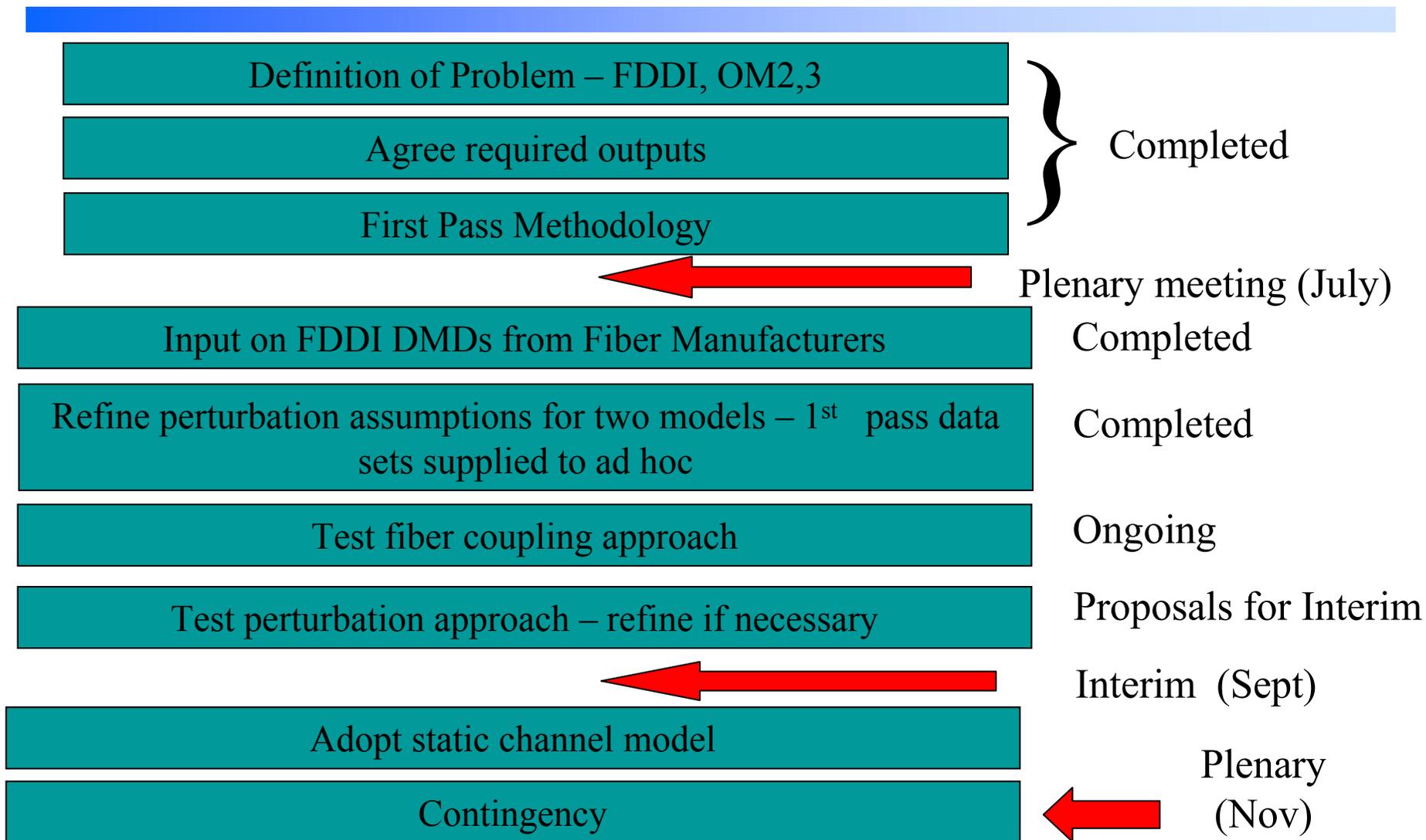
- Regular overall telecons to review progress
- Minutes have been distributed to the 10GMMF reflector
- Most of activity now in task groups

<b>Task 1</b>	FDDI-grade/OM2/OM3 model	Richard Penty
<b>Task 2</b>	Time-varying study & modal noise	Jonathan King
<b>Task 3</b>	Input and output parameters	Lars Thon
<b>Task 4</b>	Launch and filter modeling	Yu Sun
<b>Task 5</b>	Validation	Nick Weiner

# Task 1: FDDI-grade/OM2/OM3 Fiber Model – Goals (Richard Penty)

- Determine FDDI and OM2,3 fiber static channel models
- Provide key model outputs to other tasks
  - Index perturbations of challenged fibres (task 4)
    - *Initial restricted set distributions have been delivered*
  - Results for validation (task 5)
- Agree techniques for including mode coupling along link and at connectors
  - *Paper has been written by Petar Pepeljugoski*
- Provision of data sets to task group
  - *Proposed FDDI restricted set and Monte Carlo distributions will be available at the meeting for adoption (previous restricted set distributions have been previously made available)*
  - *OM3 Monte Carlo distributions are also currently available*

# Task 1: Suggested Timelines - FDDI



# Task 2: Time-Varying Study & Modal Noise (Jonathan King)

## Goals

- Study the impact of time varying effects on the LRM draft spec
  - Provide input to the TP3 time varying component of the receiver compliance test
    - Set a frequency below which EDC should track (TP3 test rate) and/or
    - Define tracking 'mask' - size vs frequency of perturbation
  - Define spectrum and extent of time variation effects
    - What is a real life environment like? what's already out there ?
    - Measure effect of environment on channel performance
  - Modeling of extent of time variance of links
    - Effect of temperature on link components
  - Study of modal noise of the MMF channel
    - Assess modal noise penalty for different laser types

# Task 2: Progress

## To date

- 'Standard link' for modeling and experiments agreed
  - 4 connectors, with 2 connectors at 7micron offset (worst case consistent with preceding standards and existing link specs)
- Referencing GR-63-CORE for operational vibration testing
  - describes vibration tests for in-building environment at constant acceleration, (0.1g & 1g) from 5-100 Hz (vibration amplitude  $\sim 1/f^2$ )

## Active

- Experiments to determine relationship of mechanical perturbation spectrum to modal noise spectrum have just started.
  - First experiments at 10-100Hz, 3-5mm movement ( $\sim 4x$  GR-63-CORE spec)
  - Up to 3x frequency multiplication observed to date
  - Greatest effects seen at low frequencies
- Study of temperature effects in progress
  - Comprehensive list of mechanisms compiled and size of each effect determined Most temperature effects are not an issue; remaining significant effects will be subject of further study - more detail in Popescu\_02\_0904
- Modal Noise calculations planned
  - Modal noise calculations may need to be adapted to for equalized links in order to include noise enhancement

# Task 3: Input /Output Parameters and Data Exchange Formats – (Lars Thon)

## Goals

- To support efficient evaluation of system performance at multiple levels of implementation detail,
  - as required by the task force,
  - by aiding the efficient exchange of data and parameters between various subtasks.
- To enable efficient cross-checking of results obtained from different measurements, tools and methodologies.

## Outputs to date - Cambridge Release 1p1 Matlab database

- Cambridge model Matlab database available from Jonathan Ingham <jdi21@eng.cam.ac.uk>.
- CamMMF.all.1p1.mat, 2152kB (matlab 7 only).
- CamMMF.all.1p1.matlab6.mat, 2556kB (matlab 6).

# Task 4: Launch and Filter Modeling

## (Yu Sun)

### Goals

- To compare the tolerance to the connector offset of different launch conditions using PIE metrics to quantify system performance
- To identify a restricted index profile set( the worst case fiber set) for each considered launch conditions
- To specify a TP2 optical launch profile which enables the maximum number of solutions (modified encircled flux?)

### Proposed activities

- Link without connectors
  - To optimize beam size for each launch condition.
  - To compare the pulse response and PIE metrics.
- Link with connector
  - Suggest the connector offset proposed by Task 2
  - To address the dynamic variation caused by temperature, polarization or mechanical perturbation, suggest including the rotation of polarization in the simulation

# Task5: Validation approaches (Nick Wiener)

## Goals

- Validation of model in terms of 10 GbE extended reach operation
- Determination of any new measurements / field tests needed for validation
- Identification of issues relating to compliance

## Proposed Activities

- Receive modelling responses from Task 1
- Meeting at plenary with other task group leaders to sketch out likely test conditions needed for agreed validation
- Compare output of model with 10 GbE extended reach tests
- Identify any issues which need to be taken into account in setting compliance